



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>



HARVARD
COLLEGE
LIBRARY

~~VERI TAS~~ (Library)
(City Appropriation)

SCIENCE CENTER LIBRARY

PUBLICATIONS OF THE
316
A. V. 27
3
AMERICAN
STATISTICAL ASSOCIATION.

VOLUME III.

NOS. 17-24.

1892-1893.



BOSTON:
W. J. SCHOFIELD, PRINTER, 105 SUMMER STREET.
1893.

27-3-1
1000

HARVARD UNIVERSITY LIBRARY
LAMONT FUND
PURCHASED FROM
CAMBRIDGE PUBLIC LIBRARY
10 MARCH 1948

62583

COPYRIGHTED, 1893, BY AMERICAN STATISTICAL ASSOCIATION.



CONTENTS.

LEADING ARTICLES.

Statistics of Crime in Massachusetts. <i>Fred. G. Pettigrove.</i>	1
Development of Statistics of Religions. <i>M. Fournier de Flaix</i> ; translated by <i>Alice R. Jackson.</i>	18
Net Profits of Manufacturing Industries in the State of Massachusetts. <i>Frederick B. Hawley.</i>	38
Classification of Trade Statistics. <i>Frederick C. Hicks.</i>	65
Proposed Statistical Legislation. <i>Roland P. Falkner.</i>	69
A Statistical Inquiry Concerning Domestic Service. <i>Lucy M. Salmon.</i>	89
The Theory and Practice of Price Statistics. <i>Roland P. Falkner.</i>	119
Measures of Distribution. <i>George K. Holmes.</i>	141
Statistics of Suicides in New England. <i>Davis R. Dewey.</i>	158
Semi-Annual Census of Paupers in Minnesota. <i>H. H. Hart.</i>	176
Convention of Commissioners of Bureaus of Labor Statistics.	187
Net Profits of Manufacturing Industries in the State of Massachusetts. <i>W. F. Draper.</i>	192
International Statistical Comparisons.	199
The Establishment of an Imperial Commission for Labor Statistics in Germany. <i>Carl C. Plehn.</i>	213
French Statistical Publications. <i>Charles D. Hazen.</i>	220
Sketch of Life of Robert W. Wood, M.D. <i>John Ward Dean.</i>	232

The Necessity of a Revision of the Classification and Nomenclature Employed in the Vital Statistics of Massachusetts. <i>S. W. Abbott.</i>	279
Observations on the Measure of Change. <i>Charles H. Cooley.</i>	285
Cost Statistics of Public Electric Lighting. <i>Victor Rosewater.</i>	293
Immigration and the Foreign-Born Population. <i>Richmond Mayo-Smith.</i>	304
The Value of Percentile Grades. <i>Luther Gulick.</i>	321
Murders in Massachusetts. <i>Waldo M. Cook.</i>	357
Classification of Occupations in the Census. Translation of Report made by <i>M. Bertillon.</i>	379
Growth of Cities in the United States During the Decade 1880-90. <i>Carl Boyd.</i>	416
The Vital Statistics of an Apache Indian Community.	426
Statistical Data for the Study of the Assimilation of Races and Nationalities in the United States. <i>Richmond Mayo-Smith.</i>	429
Report of an International Mortality Standard, or Mortality Index. <i>Joseph Körösi.</i>	450
Character and Volume of the Money of the United States. <i>Maurice L. Muhleman.</i>	468
Fluctuations in the Secured Circulation of the National Banks and their Relations to the Prices and Investment Values of Bonds. <i>Charles A. Conant.</i>	471
Currency Reform in Austria-Hungary. <i>Julius Mandello.</i>	477
Comparative Statistics of Primary Education. <i>E. Lavasseur.</i>	481
Results of Recent Investigations on Prices in the United States. <i>F. W. Taussig.</i>	487
Geographical Concentration: an Historic Feature of American Agriculture. <i>John Hyde.</i>	492
The Course of Wages in the United States Since 1840. <i>Carroll D. Wright.</i>	496

Some Recent Results in Railway Statistics in the United States. <i>Henry C. Adams.</i>	501
The Condition and Needs of Statistics of Marriage and Divorce. <i>Samuel W. Dike.</i>	513
Railway Statistics as Applicable to Earnings of Passenger Trains. <i>M. Riebenack.</i>	519
Comparability of Trade Statistics of Various Countries. <i>A. E. Bateman.</i>	533
The Geographical Distribution of the Population of the United States. <i>Henry Gannett.</i>	551
A Preliminary Report on Anthropometry in the United States. <i>Edward Mussey Hartwell.</i>	554
Remarks on the Theory of Anthropometry. <i>Franz Boas.</i>	569
On the Application to Individual School Children of the Mean Values Derived from Anthropological Measurements by the Generalizing Method. <i>W. Townsend Porter.</i>	576
Anthropometric Statistics of Amherst College. <i>Edward Hitchcock.</i>	588
An Anthropometrical Study of the Effects of Gymnastic Training on American Women. <i>Claës J. Enebuske.</i>	600
Railway Freight Traffic Statistics. <i>C. P. Leland.</i>	611

REVIEWS AND MISCELLANY.

Anthropometry.	185
Buenos Ayres, The Civil Service of. <i>L. P. Lane.</i>	343
Canadian Census, Bulletins of the.	334
Charities and Corrections, Reports of.	341
Children, Physical and Mental Condition of.	352
Church, Statistics, Free.	355
Correction, A.	192
Criminal Statistics of Buenos Ayres. <i>L. P. Lane.</i>	268
Divorce in France, Statistics of. <i>G. N. Calkins.</i>	184
“ Statistics in the United States.	78
Emigration, Assisted. <i>W. Z. R.</i>	345
French Population. <i>W. Z. Ripley.</i>	248

German Periodicals and Journals, Statistical Articles in.	<i>Victor Rosewater, C. F. A. Currier.</i>	81
Health, Effect of Occupation on.	<i>S. W. Abbott.</i>	238
Illegitimacy, A Statistical Study of.	<i>C. F. A. Currier.</i>	179
Index Numbers.	<i>A. Sauerbeck.</i>	346
Interest, Fall of the Rate of, and its Influence on Provident Institutions.	<i>Francis Walker.</i>	255
Jewish Statistics, Studies in.	<i>C. F. A. Currier.</i>	75
Labor Bureaus, Note on.		339
“ Statistics, Reports of.		336
Life in France, Average Length of.	<i>G. N. Calkins.</i>	269
Legislation, State, of 1892, Relating to Statistical Inquiries.		349
London, Ten Years' Growth of City of.	<i>C. F. A. Currier.</i>	265
Marriages in Prussia, Fertility of, According to the Religious Creeds of the Contracting Parties.	<i>G. N. Calkins.</i>	244
Miscellaneous.		356
Mortality Experience.	<i>Miles Menander Dawson.</i>	332
“ Influence of Occupations upon.	<i>W. Z. Ripley.</i>	241
“ and Insurance of Colored Persons.		350
Mortgage Indebtedness in Europe.	<i>George K. Holmes.</i>	181
Note from Mr. Francis Galton to Mr. George K. Holmes on the Subject of Distribution.		271
Occupation, Effect of, on Health.	<i>S. W. Abbott.</i>	238
“ Influence of, upon Mortality.	<i>W. Z. Ripley.</i>	241
Parents' Age, Effect of, on Vitality of Children.	<i>G. N. C.</i>	254
Poverty, Causes of.	<i>G. N. Calkins.</i>	79
Prisoners, Statistics of, 1890.		191
Records of Massachusetts, Local Public.	<i>G. N. C.</i>	267
Registration Report of Massachusetts.	<i>G. N. C.</i>	273
Sexes, Geographical Distribution of.		251
Statistics, Limitations of.	<i>Stephen F. Weston.</i>	259
Stature, On Some Relations of Human, to Muscular Strength.		347
Suicides in the Austrian Army in the Years 1873-90.	<i>G. N. C.</i>	264
University Course in Statistics, A.		186
“ of Vienna, Work of the Statistical Seminary at.		
<i>Victor Rosewater.</i>		266
Vitality of Children, Effect of Parents' Age on.	<i>G. N. C.</i>	254
Women, Earnings of, in Michigan.	<i>Lucy M. Salmon.</i>	235
Wool Book, The.		76

CONSTITUTION

OF THE

AMERICAN STATISTICAL ASSOCIATION.

ARTICLE I. This Association shall be denominated the AMERICAN STATISTICAL ASSOCIATION.

ART. II. The objects of the Association shall be to collect, preserve, and diffuse statistical information in the different departments of human knowledge.

ART. III. The Association shall be composed of Fellows and Honorary Members.

ART. IV. All members shall be chosen by ballot; nomination for membership shall first be submitted to the Board of Directors; if approved by them, the names shall be presented to the Association, and for election the affirmative votes of four fifths of the members present shall be necessary. Each Fellow shall pay annually two dollars, or twenty dollars at some one time.

ART. V. Fellows only shall be entitled to vote, but Honorary Members shall have the right to sit and deliberate in all the meetings of the Association.

ART. VI. The officers of the Association shall be a President, five Vice-Presidents, a Recording Secretary, a Corresponding Secretary, a Treasurer, a Librarian, and three Counselors, who, together with the President and Secretaries, shall form a Board of Directors for the government of the institution, three of whom shall constitute a quorum at any meeting regularly convened. There shall be also three Standing Committees of three members each, namely, on Publication, on Finance, and on the Library.

ART. VII. The Association shall meet in the city of Boston, on the third Friday in January, April, and October, and at such other times as the Board of Directors shall appoint. At the annual meeting in January, the Association shall hear reports of the Board of Directors, of the Treasurer, of the Librarian, and of the Standing Committees, elect officers, and transact other business. Vacancies may be filled at any regular meeting. Five members shall be necessary to form a quorum for transacting business and the election of members, but a less number may adjourn the meeting.

ART. VIII. No alteration in this Constitution shall be made except on notice at a previous meeting, and by a vote of three fourths of the members present.

NOTE.— Each member shall be entitled to receive all reports and publications of the Association.

AMERICAN STATISTICAL LIBRARY.

The American Statistical Association possesses a Statistical Library, the result of forty years' collection, which is designed as a depository for statistical works of every nature. At present the Library is placed in rooms 31-33, Rogers Building, Massachusetts Institute of Technology, Boston. Its collection embraces not only the publications of the United States, but also many valuable reports issued by Statistical Bureaus of foreign countries. It also includes the very valuable statistical library collected by the former President, Dr. Jarvis, and bequeathed to the Association upon his death, in 1884. It is believed that the collection and preservation of reports which admit of a classification according to statistical groupings, will be of great public service, and the Association therefore earnestly requests a generous co-operation in still further enlarging the library in such directions.

Reports of vital and social statistics, registration reports, census documents, municipal reports, documents relating to public works, reports of trade, commerce, taxation, finance, insurance, industry, labor, health, crime, education, and religion are especially desired. Due acknowledgment of all donations will be given, and, when practicable, an exchange with the Publications of the Association will be made. It is especially desired that members of the Association will contribute copies of their writings.

For further information address

DAVIS R. DEWEY, *Secretary*,
Institute of Technology, Boston.

QUARTERLY PUBLICATIONS OF THE
AMERICAN
STATISTICAL ASSOCIATION.

- I. STATISTICS OF CRIME IN MASSACHUSETTS. BY FRED. G. PETTIGROVE.
 - II. DEVELOPMENT OF STATISTICS OF RELIGIONS. BY M. FOURNIER DE FLAIX; TRANSLATED BY ALICE R. JACKSON.
 - III. NET PROFITS OF MANUFACTURING INDUSTRIES IN THE STATE OF MASSACHUSETTS. BY FREDERICK B. HAWLEY.
 - IV. CLASSIFICATION OF TRADE STATISTICS. BY FREDERICK C. HICKS.
 - V. PROPOSED STATISTICAL LEGISLATION. BY ROLAND P. FALKNER.
 - VI. REVIEWS AND NOTICES: STUDIES IN JEWISH STATISTICS, *Charles F. A. Currier*; THE WOOL BOOK; DIVORCE STATISTICS IN THE UNITED STATES; CAUSES OF POVERTY, *G. N. Calkins*.
 - VII. STATISTICAL ARTICLES IN GERMAN PERIODICALS AND JOURNALS. VICTOR ROSEWATER, CHARLES F. A. CURRIER.
-

BOSTON:
AMERICAN STATISTICAL ASSOCIATION.

1892.

COPYRIGHTED, 1892, BY AMERICAN STATISTICAL ASSOCIATION.

CONTENTS.

I. STATISTICS OF CRIME IN MASSACHUSETTS. <i>By Fred. G. Pettigrove.</i>	1
II. DEVELOPMENT OF STATISTICS OF RELIGIONS. <i>By M. Fournier de Flaix</i> ; translated by <i>Alice R. Jackson.</i> . .	18
III. NET PROFITS OF MANUFACTURING INDUSTRIES IN THE STATE OF MASSACHUSETTS. <i>By Frederick B. Hawley.</i>	38
IV. CLASSIFICATION OF TRADE STATISTICS. <i>By Frederick C. Hicks.</i>	65
V. PROPOSED STATISTICAL LEGISLATION. <i>By Roland P. Falkner.</i>	69
VI. REVIEWS AND NOTICES:—	
Studies in Jewish Statistics. <i>Charles F. A. Currier.</i> .	75
The Wool Book.	76
Divorce Statistics in the United States.	78
Causes of Poverty. <i>G. N. Calkins.</i>	79
VII. STATISTICAL ARTICLES IN GERMAN PERIODICALS AND JOURNALS. <i>Victor Rosewater, Charles F. A. Currier.</i>	

AMERICAN STATISTICAL ASSOCIATION.

NEW SERIES, No. 17.

MARCH, 1892.

Read before the AMERICAN STATISTICAL ASSOCIATION, Jan. 22, 1892.

STATISTICS OF CRIME IN MASSACHUSETTS.

BY FRED. G. PETTIGROVE.

In the introduction to his work upon the American Commonwealth Prof. Bryce refers to "the special skill and knowledge needed to distill from rows of figures the refined spirit of instruction." We are reminded of this apt suggestion when we see widely differing opinions seeking support from the same statistics. It is not surprising that uninterested persons very often, to quote a great English satirist, reach a point where they look upon all statistical information as merely "little rivers of tabular statements periodically flowing into the howling ocean of tabular statements which no diver ever got to any depth in and came up sane." Despite this contemptuous estimate, however, every thoughtful person admits today that statistics are fraught with meaning, and make the basis for nearly all reforms. Disputes as to their significance do not lessen their value, for out of the shock of controversy comes the spark of truth.

I remember that the general subject of statistics of crime in this state has been ably treated by two eminent authorities,

Carroll D. Wright and William T. Harris; and that very recently the subject has been discussed with keen intelligence in the *Forum* magazine. If your Secretary had not assured me that this Association expects from me an explanation of the statistics, more than a comparison of the present time with former generations, I should not venture to consider a topic that has been so thoroughly canvassed. I leave out of this paper any extended discussion of prison systems. I omit also any comparison with the statistics of Great Britain; until we can send some of our criminals to another community we shall not be in a condition to make a comparison with her upon equal terms. English penologists have claimed that transportation, which was adopted in 1787 and abandoned in 1840, did not reduce crime. A parliamentary committee, in 1838, reported that when London was emptied of its thieves, by transportation to New South Wales, a new crop of criminals immediately appeared; the criminals were banished, but the crime remained. Her modern statesmen do not share in this belief, however, for they have returned to the old scheme of transportation, under the new name of assisted emigration. Another reason why comparison with Great Britain cannot fairly be made is that in many of her communities the laws are not enforced with any approach to the rigor that prevails in this state. The warden of the central prison in Toronto, who certainly would not be prejudiced against Great Britain, bears witness to this fact in his testimony given before the Ontario Commission of 1889. It must be admitted, however, that Great Britain has a superior prison system; and once the prisoner is committed, he is subjected to a just and wholesome discipline.

Neither can we with fairness compare the statistics of Massachusetts with those of other states. Comparison with an interior state would be worthless, and there is no other seaboard community that stands in the same position, as to immigration, that is occupied by Massachusetts. New York comes the nearest to us in this respect, but I have been in-

formed that a much larger percentage of the immigrants who land at New York go to the west than is the case with those who disembark at Boston. It is true that these immigrants do not bring with them any great amount of serious crime, but they have not been trained to observe social regulations equal to the standard set up by our industrious legislature, that has, in the words of an ex-governor, made the manufacture of offences a state industry. The introduction of such an element into our population cannot do otherwise than help to swell the ranks of prisoners committed for offences against public order.

In the limited scope of this paper very little attention can be paid to the statistics of long ago, and, if space permitted, it would not be profitable to quote them to any extent, because they must, in the nature of things, be exceedingly unreliable.

The earliest attempt to gather official statistics of crime was in 1832, when it was made the duty of the attorney-general to make a report of criminal cases to the General Court. This report related only to part of the prosecutions, and does not form a reliable source from which to obtain figures for a comparison with the present day. The office of attorney-general was abolished in 1843, and from that time to 1849, when the office was re-established, this report was made by the secretary of the Commonwealth. In 1840 it was made the duty of the secretary to receive and compile, for the use of the legislature, the returns of commitments to the jails and houses of correction; this last named act seems to have been defective, for in 1857 it was enacted that a penalty should be imposed upon any officer who failed to make the returns required by the act of 1840. In April, 1863, the board of state charities was established; it was made the duty of this commission to supervise and inspect all correctional and charitable institutions, and to make an annual report concerning them. This was the nearest approach to a systematic and comprehensive statement of the commitments to prisons that had then been made in the state. The work of prepar-

ing the figures was all under the able direction of Mr. Sanborn, and returns were presented according to an act drawn by him in 1864. In 1870 three commissioners of prisons were appointed to supervise the jails and houses of correction, and again the statistics were divided. The report of this board related at first only to the county prisons, and, although it afterwards included the Reformatory Prison for Women, it never referred to the State Prison. It was necessary to consult their report and the report of the last-named institution to find the whole number of commitments. In 1879 the present board of Commissioners of prisons was established. The first secretary was Mr. Spalding, and I quote from the first Commissioners' Report, that it was my duty to prepare, when I say that he "succeeded under great difficulties in establishing a system of securing prison and court returns for the preparation of reliable criminal statistics."

This long preliminary statement is necessary to explain the great lack of uniformity in the statistics,—a lack which makes perfect comparison impossible. We have made some improvement, but the difficulties in the way of a clear statement are not entirely removed, for the law relating to the distribution of public documents makes it necessary to present the report of the commissioners in separate parts, one relating to the State Prison, another to the Reformatory Prison for Women, a third to the Massachusetts Reformatory, and a fourth to the jails and houses of correction and criminal matters in general. This arrangement, which is adopted for good reasons, is somewhat confusing to one who is not familiar with it. It must be borne in mind that the report is designed to give to the General Court information upon all prison and criminal subjects; to furnish, perhaps, a reason for the passage of new laws or the repeal of old ones. It contains so many things besides the statistics that a more extended examination is required to ascertain the state of criminality than would suffice for that purpose if it were

devoted to figures upon that subject alone. The statistics of crime are presented in the report in four classes. The figures of general interest to the statistician are to be found in the fourth part of the report, and the student of social conditions should disregard the other parts, which deal only with particular institutions. The reports in detail upon each county prison, and the financial statement showing the expense of maintenance, the receipts for labor, etc., must also be passed over by such a student. The statistics that should be studied are, *first*, the tables showing the number of commitments to the various institutions, setting forth the offences and sentences in full, and giving as nearly as can be ascertained the ages, birthplaces, recommitments, parentage, education, conjugal condition, etc., which tables are compiled from returns made at regular intervals by officers in charge of the prisons; *second*, the statements compiled from returns of arrests that were first presented in 1882 in accordance with an act passed in that year requiring the police officers to make reports to the commissioners; and *third*, the tabular statements showing the results of criminal prosecutions.

It is to be noticed here that the number of commitments is greatly in excess of the number of criminals, for it is impossible to determine exactly how many times an offender is committed to prison during the year. Although a large number of the prisoners are recognized as recommitments, all the persons who come under that head are not identified, because the officers of one county cannot know the old offenders of another county. Reliable knowledge upon this point can only be secured by adopting some efficient and uniform method of registering and identifying prisoners. The adoption of such a system would give correct information as to identity, and, besides its value in this respect, it would enable the courts to deal more effectively with a certain class of offenders. The returns of arrests are received monthly from the chiefs of police or the city marshals in the towns that maintain such officers; in all other cases an annual return only is

required. The facts as to criminal cases are presented to the commissioners in a yearly report from the courts.

The statutory division of crimes in Massachusetts is not observed in presenting the statistics, except in relation to offences against person and property. The reports include three classes of crimes,—the first being offences against the person, the second against property; in the third class, under the head of offences against public order, etc., are included offences against the currency, against public justice, against the public peace, against chastity, morality, etc., against the public health, and against public policy, etc. A few offences are not classified in the statutes; these are included in the tabulation under one of the three divisions, according to the nature of the crime. The enumeration of these classes of crime proves how closely the law makers have analyzed the possible transgressions of the citizens; and a detailed list of the particular crimes would show a large number of offences that are peculiar to the criminal code of Massachusetts. In one table in the report all the statutory offences committed in the year are printed, but sixty-one different titles, invented by the makers of complaints, have been included under some other head; the only difference is in phraseology, but it illustrates the comprehensive nature of the offences. This fact furnishes another reason why it is impracticable and useless to make a comparison with the earlier years of the century; we now have upon our statute books nearly twice as many punishable offences as were named in the laws fifty years ago. Furthermore, the machinery for the execution of the law has been so improved, and attention is so readily attracted to the slightest misdemeanor, that, whereas in former years many trifling violations of the law were allowed to go unnoticed, scarcely a single act that can be tortured into an offence is permitted to go unpunished today. As an instance of the ingenuity of the persons who make complaints in court, I mention the case of the person who was complained of last year for “disobeying a police-

man." With what amazement a descendant of the "tea spillers" must regard such a prosecution! It only shows how reckless the administration of the law has become when such a complaint can be formulated and entertained by a court. If we are to be prosecuted for disobeying a policeman, how long may we hope to escape punishment for being disrespectful to a janitor?

We have now reached a point where the legislature has provided for uniform statistics, but we yet encounter some difficulties in securing correct returns. One clerk of the court under the head of "pleas" puts "not arraigned," forgetting to tell us how a person who was not arraigned could be expected to make any plea. Another clerk returns a case as "offence not charged," and follows it with the quite unnecessary statement that no indictment was found. These are only types of other inaccuracies that we are obliged to correct before the figures can be tabulated.

Although we cannot make full comparisons with the years prior to the adoption of a system of uniform statistics, a sufficiently close comparison for all practical purposes can be made for the last ten years, during which period the same method of collecting the returns has been observed, and substantially the same conditions of society have prevailed.

Comparing the year 1890 with that ending September 30, 1881, we find that the whole number of commitments increased enormously, the figures having risen in ten years from 17,062 to 33,290. The statement of this increase is startling, but it would be unwise to form a conclusion without taking into account the nature of the offences wherein there was an increase. Examining the offences by classes, we find in those against the person that the number of assaults rose from 1589 in the first year to 1732 in the last year; this was a large increase, but not so great as it would have been if it were not easier for the policeman to obtain a conviction for drunkenness than for assault. For manslaughter the commitments were the same, although the number varied greatly in the

intervening years. Murder and accessory with four cases in 1881 had only two in 1890, and only one in either of the two years immediately preceding. We perhaps may be less disturbed by the increase in commitments for "walking on the railroad," "standing on the sidewalk," "stealing a ride," "tramping," etc., if, to paraphrase the observation of the brilliant Frenchman, the murderers will help us to abolish capital punishment by reducing the number of their crimes. Robbery, a crime which is put into the first class because it has an element of danger to the person, although it is quite as much a crime against property, increased from eleven to eighteen, a very large percentage; but the number of robbers who were caught was comparatively small in either year. Leaving out the assaults which (with the exception of a few perpetrated with the intent to commit felony) are twin brothers to drunkenness, there were actually fewer commitments for offences against the person in Massachusetts in 1890 than in 1881.

In offences against property there was, to begin with, a falling off in the cases of arson from six to two. We can endure the greater activity of the police in committing drunkards and vagrants, even if it does give us a bad reputation, if our lives and our dwellings are to be safer. Breaking and entering has increased. Relatively, the burglars are few in number, but their power to terrify the community exceeds that of all other criminals, and it is a serious matter when burglary shows the slightest increase. It should be remembered, however, that not all these cases of breaking and entering amount to burglary; some of them are the acts of youthful thieves who break and enter a shop, and whose crimes do not approach the character of an offence against the person, as does burglary. These young offenders, perhaps, need not be sent to prison for long terms, but for the scoundrel who enters a house at midnight prepared to do murder, if he is molested while committing another crime, there is no punishment too severe. If his character as a criminal of this

kind is fully established, and his crime is clearly proven, he should be committed to prison for an indefinite period; he should never be permitted to go at large into the community again until he becomes incapable, either by a complete reform or by old age, of renewing his offences. Embezzlement has increased from forty-two cases to seventy-two, but all embezzlements in the tables do not refer to the acts of cashiers or others holding positions of trust and responsibility; some of them would better be described as petty larcenies. We had fifty-seven frauds in the first year and nearly double the number in 1890. All the persons charged with fraud did not attempt to cheat a bank or to negotiate a loan; some of them succeeded only in obtaining a week's board without paying for it. Larceny is the most popular crime against property; nothing seems to check the industry of the thief; no punishment that human ingenuity has yet devised seems to affect the criminals who make larceny a trade. Rigorous treatment in prison, branding, hanging even, has not seemed to have much deterring influence upon this class of offenders. Receiving stolen goods shows a comparative increase, and all other offences against property a decrease.

In crimes against public order, etc., commitments for lewdness and kindred offences increased in number, but this is doubtless owing to the more vigorous execution of the law rather than to any other cause. It may be said in parentheses that the best analysis we can make, and the fairest comparison possible, shows that crime amongst women in Massachusetts has decreased very materially in the last few years. This condition has been attributed partly to the excellent methods of the reformatory prison at Sherborn, but the main reason for it will, unquestionably, be found in the fact that opportunities for the employment of women are constantly improving. The offence of disturbing the peace has a smaller number in 1890 than in 1881, but the decrease is due to the same cause that kept down the number of assaults, it being easier for the police officers to complain of a man for drunkenness than to

make any other charge. Counterfeiting has almost disappeared from the list, but forgery shows about the same ratio of increase as embezzlement.

For violating the liquor laws 120 persons were committed in 1881, and 506 in 1890. This enormous increase may not be caused by any greater criminality in the dealers, but by the better enforcement of the statutes and the fact that there is more law to violate. Polygamy, with ten cases in 1881, had only eight in 1890. The same number of tramps appeared in 1890 as in 1881, but there were more vagabonds and vagrants. To compare these offences they should be added together, since the statutory distinction between them is not always observed by the courts. In other offences of the third class there was a considerable increase.

From the commitments of the last ten years it appears that serious crime in Massachusetts has diminished. I have not filled this paper with detailed statistics of offences nor percentages of crime, but a brief summary of the figures as given by me in an article in the *Boston Transcript* last year may be readily borne in mind, and for that reason I reproduce them here. The population of Massachusetts in ten years increased nearly twenty-six per cent. The commitments for offences against the person including assaults, which are usually the result of drunkenness, increased eight per cent; in offences against property the increase was fourteen per cent. The proportionate decrease in crimes against property is the more striking when we remember that the population of Massachusetts has in recent years been going rapidly to the cities. While it is true that startling and atrocious crimes are not relatively more frequent in crowded communities than in the sparsely-settled regions, it is doubtless the fact that offences due to idleness, to poverty, and to weak wills are oftener found in the cities than in the country.

In studying the statistics we should remember that many persons convicted of minor offences are punished by fine, and pay the penalty without going to prison; they do not appear

in the table of commitments, and no exact comparison of the number of offenders can be made without taking into consideration all the criminal prosecutions. We will, therefore, briefly examine the court returns to ascertain if they confirm the conclusion that has been reached by a study of the prison figures. This review cannot cover the entire ten years, because in 1881 the returns from the lower courts were not tabulated. We may take, however, for comparison the last five years, in which uniform statistics have been received, and the same method of presenting them has been followed in the reports.

During the year ending September 30, 1886, the number of cases begun in the superior courts was 4946; in the year ending September 30, 1890, it was 4625. This decrease indicates clearly, as does the falling off in the commitments, a lessening of the serious crimes. In 1886 there were 2246 sentences imposed: in 1890 there were only 2158. If the decrease appeared only in the offences of the third class, it might be attributed to a change in practice by which more cases would be disposed of in the lower courts; but, as there were fewer cases in 1890 than in 1886 in each of the three classes, it is a fair inference that the smaller number in the later year represents a real decline in serious criminality. In 1886 there were brought before the police, municipal, and district courts and trial justices 62,852 cases; in 1890 the number was 81,255. The increase of 18,403 is largely made up by the additional prosecutions for drunkenness, which rose from 33,927 to 51,026: leaving this offence out of the question there was, in proportion to the growth in population, a substantial decrease in the amount of criminal business. The arrests, for the same period of five years, show an increase from 61,340 to 80,844. The same offence, that caused the great addition to the number of cases in the lower courts, is almost wholly responsible for the larger number of arrests; any increase, other than for drunkenness, may safely be ascribed to the greater zeal of the officials.

From an examination of the statistics what lessons can be learned? There is not space remaining to permit more than a brief reference to some of the conclusions that may be drawn from the study of the figures.

The increase in the cases of drunkenness has been large, but in criminality there has been a relative decrease. Although we have not retrograded as rapidly as unfriendly critics have declared, we must confess that we have not progressed as far as we ought to have done in reducing crime under our high state of civilization. With a legislature meeting annually for the improvement of the laws, we should have reached a much higher degree of efficiency in dealing with criminals than now marks our methods. But the statesmanship that multiplies offences, and at the same time crowds into a single institution all classes and conditions of prisoners, putting the drunkard with the thief, the vagrant with the burglar, will surely make criminals.

In considering the changes that seem desirable it appears to me that there should be more uniformity of punishment; this can only be obtained by adopting the indeterminate sentence for all serious crimes. It would not be wise, under the present plan of term sentences, to take from the judges the discretion they now have in the punishment of certain offences. Breaking and entering, for example, is an offence that varies to such an extent, in its degrees of criminality, that no inflexible rule for its punishment could with justice be prescribed. The only remedy, then, for the inequality of sentences is to provide that a man shall be sent to prison until he appears, under proper regulations, to be fit to be trusted with his liberty.

There should be longer sentences for vagrancy; the tramps, vagabonds, and vagrants that infest certain communities in the summer time should not be allowed their liberty during the good months in the year, and then be maintained at the public expense during the winter, when they are compelled to abandon their predatory habits. If they were put to hard

labor in a county jail or workhouse, during the entire twelve months, it might have the effect of inducing some of them to avoid the prison after a single term.

Another suggestion is that drunkards should not be sent to prison unless they commit some other offence. Dr. Keeley claims that he can cure drunkenness. If he can do so, it is a disease; if it is a disease, it is not a crime; and if it is not a crime, it should not be punished by imprisonment in an institution designed for criminals. The Massachusetts legislature approved this principle a few years ago, when an act was passed to establish a hospital for dipsomaniacs. Sending a man to prison for drunkenness because he has committed an assault, or is a disturber of the peace, is an absurdity, differing in degree only from what would appear if a drunken murderer were punished for drunkenness instead of for murder.

One other impressive lesson is that we send too many young men to prison. Boys whose offences indicate in many instances more a mischievous spirit than a criminal character are sent, without any sufficient preliminary investigation, to become the associates of persons hardened to a criminal life. The effect of such a practice must inevitably be injurious to the last degree. The reformer who desires an improvement in the criminal law need not go beyond the probation work to find a mission.

The treatment of prisoners and the management of prisons generally has in recent years received marked attention in public discussions. The considerable increase in the cases of drunkenness, of vagrancy, and such offences has been attributed to a want of proper supervision, and the lack of discipline in the penal institutions. Persons wholly unfamiliar with the subject have quickly settled, on paper, the most difficult problems that confront the prison officers. Editors, ignorant of the statutes even, have freely given instructions in the administration of the law. It may be true that in some respects the management of the prisons could be improved.

It is very likely that too much money is spent upon some of our institutions, and that part of the effort now put forth for the reformation of prisoners is misdirected. There is no doubt that in some institutions the discipline is not sufficiently strict; but when you seek the primal cause of our rapidly-filling prisons you will find it in the absurdities of the statutes, and in the carelessness of the courts.

An abstract of the statistics referred to in the preceding paper is presented below for the convenience of persons who cannot readily refer to the Commissioners' report. Since the paper was presented, the annual report for 1891 has been submitted to the General Court, and the figures for that year are included.

COMMITMENTS TO PRISONS.

1.—AGAINST THE PERSON.

Offences.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.
Assault.....	1,589	1,590	1,560	1,719	1,754	1,641	1,537	1,636	1,799	1,732	1,692
Manslaughter.....	10	11	7	8	13	12	10	11	8	10	12
Murder and accessory.....	4	5	3	3	3	2	6	1	1	2	4
Rape.....	3	7	3	3	6	3	6	4	7	7	6
Robbery.....	11	17	18	32	24	31	21	19	27	18	31
Miscellaneous.....	69	61	69	68	79	82	71	83	46	52	54
Total.....	1,686	1,691	1,660	1,833	1,879	1,771	1,651	1,754	1,888	1,821	1,799

2.—AGAINST PROPERTY.

Arson.....	6	4	17	11	10	11	7	3	7	2	1
Breaking and entering.....	186	189	169	212	271	231	241	270	314	267	319
Embezzlement.....	42	48	53	44	54	43	66	66	65	72	52
Fraud.....	57	64	62	85	92	94	75	95	116	108	96
Larceny.....	1,573	1,644	1,665	1,871	2,031	1,671	1,647	1,721	1,893	1,754	1,910
Receiving stolen goods.....	20	37	43	23	36	40	38	44	39	59	48
Miscellaneous.....	330	297	353	361	425	358	375	294	346	305	334
Total.....	2,223	2,283	2,352	2,637	2,918	2,448	2,449	2,491	2,779	2,547	2,762

3.—AGAINST PUBLIC ORDER, ETC.

Abortion.....	1	4	1	1	1	...	3	1	1	2	1
Adultery.....	37	48	57	68	63	81	61	68	77	79	62
Common night-walker.....	74	107	147	125	139	158	99	76	118	115	123
Disturbing the peace.....	582	526	511	555	527	432	361	365	451	300	597
Drunkenness.....	10,930	16,769	17,854	19,564	18,701	17,981	19,952	23,407	25,879	25,680	19,794*
Forgery.....	15	35	17	29	41	30	28	23	32	27	13
Fornication.....	85	102	87	87	77	103	172	170	159	133	147
Idle and disorderly.....	148	122	111	166	237	242	188	139	218	176	266
Lewd cohabitation.....	3	21	11	6	11	9	11	19	26	16	19
Lewdness.....	37	36	43	43	48	55	30	59	65	72	87
Liquor laws, violating.....	120	121	106	164	134	260	290	369	485	506	398
Polygamy.....	10	11	14	7	9	7	12	10	9	8	11
Tramps.....	211	168	203	183	285	303	177	214	247	212	**
Vagabonds and vagrants.....	413	384	554	751	902	878	768	714	824	704	800
Miscellaneous.....	487	437	397	520	679	700	573	804	836	796	916
Total.....	13,153	18,891	20,113	22,269	21,854	21,239	22,725	26,438	29,427	28,922	23,234

RECAPITULATION.

1.—Against the person....	1,686	1,691	1,660	1,833	1,879	1,771	1,651	1,754	1,888	1,821	1,799
2.—Against property.....	2,223	2,283	2,352	2,637	2,918	2,448	2,449	2,491	2,779	2,547	2,762
3.—Against public order, etc.....	13,153	18,891	20,113	22,269	21,854	21,239	22,725	26,438	29,427	28,922	23,234
Total.....	17,062	22,865	24,125	26,739	26,651	25,458	26,825	30,683	34,094	33,290	27,795

* The commitments for drunkenness were reduced by the change in the law for the punishment of that offence.

** In this year the tramps are counted with the vagabonds and vagrants.

NUMBER OF CASES BEGUN IN THE SUPERIOR COURT.

Offences.	Years.					
	1886.	1887.	1888.	1889.	1890.	1891.
1.—Against the person.....	834	863	816	823	786	787
2.—Against property.....	1,431	1,366	1,473	1,514	1,389	1,396
3.—Against public order, etc.....	2,681	2,634	2,442	2,531	2,450	2,181
Total.....	4,946	4,863	4,731	4,868	4,625	4,364

NUMBER OF SENTENCES IMPOSED IN THE SUPERIOR COURT.

Offences.	Years.					
	1886.	1887.	1888.	1889.	1890.	1891.
1.—Against the person.....	368	327	315	328	287	338
2.—Against property.....	628	631	635	706	702	686
3.—Against public order, etc.....	1,250	1,193	1,103	1,193	1,169	949
Total.....	2,246	2,151	2,053	2,227	2,158	1,973

NUMBER OF CASES BEGUN IN THE MUNICIPAL, POLICE, AND DISTRICT COUNTS, AND BEFORE TRIAL JUSTICES IN EACH COUNTY.

Counties.	1886.	1887.	1888.	1889.	1890.	1891.
Barnstable.....	130	183	213	187	134	141
Berkshire.....	1,846	1,937	1,753	1,825	1,986	1,833
Bristol.....	4,685	4,329	4,659	5,478	5,511	4,954
Dukes County.....	14	36	39	36	42	49
Essex.....	6,904	7,619	9,017	9,139	9,433	10,030
Franklin.....	386	467	432	444	420	467
Hampden.....	3,673	3,532	4,323	4,709	4,417	3,767
Hampshire.....	563	600	572	697	718	551
Middlesex.....	9,201	9,659	10,502	11,391	11,630	12,259
Nantucket.....	22	17	49	20	41	18
Norfolk.....	1,985	2,058	2,477	2,373	2,606	2,402
Plymouth.....	1,701	1,635	1,547	1,571	1,564	1,447
Suffolk.....	26,186	28,815	32,426	38,412	35,941	32,945
Worcester.....	5,466	6,976	7,225	7,270	6,812	6,700
Total.....	62,852	67,863	75,234	83,552	81,255	77,553

ARRESTS FOR DRUNKENNESS AND FOR OTHER OFFENCES.

Years.	Drunkenness.			Other Offences.			Aggregates.		
	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.
1886	30,741	4,661	35,402	22,735	3,203	25,938	53,476	7,864	61,340
1887	36,496	4,961	41,456	23,258	2,977	26,235	59,753	7,938	67,691
1888	42,481	5,672	48,153	24,783	3,301	28,084	67,264	8,973	76,237
1889	47,206	5,952	53,158	26,353	3,605	29,958	73,559	9,557	83,116
1890	46,932	5,882	52,814	24,821	3,209	28,030	71,753	9,091	80,844
1891	49,969	6,543	56,512	27,327	3,275	30,602	77,296	9,818	87,114

DEVELOPMENT OF STATISTICS OF RELIGIONS.

Condensed from an Article by M. FOURNIER DE FLAIX, and translated
by ALICE R. JACKSON.

The study of the different religions of the world is a characteristic of the nineteenth century. This study occupies itself not only with religions which were formerly professed, but with those which are today professed by any portion of the human race. While all religions are more or less connected, this present sketch, however, deals only with those which are the existing religions of humanity.

The interest of the question, and the permanency of religions, should be sufficient to attract the attention of statisticians, and to invite them to give religion the place it merits in their works. Moreover, religious statistics already exist and need only to be improved. Many countries already possess them, notably, Germany, Austria, Italy, and English India. It is necessary, however, to impress the countries in which they do not exist, or in which they exist in a very imperfect state, with the great value of comparative religious statistics.

The positive knowledge of the great religions of humanity is recent, belonging rather to the second than to the first half of our century. It is therefore not surprising that the statistics upon the subject are relatively imperfect. It was not until the close of the sixteenth century that Europe knew much of the existence of other religions than Mohammedanism and Judaism. Nothing was known of their extent or sphere of action. Asia herself in great part was yet unknown.

Rabelais, Montaigne, and Bacon, however, held enlarged views of religions. These views are more pronounced with Machiavelli and, above all, with Bodin. Bodin was not only a politician and economist and publicist; he was also a savant. His different works, *La république*, *Le methodus*, *L'Heptaplomeros*, *Le theatrum mundi*, and even *La démonomanie des sorciers*, contained about all that was known

or could be known then about the religions of Chaldea, Assyria, Persia, Egypt, and of Mohammedanism. Bodin knew comparatively nothing of the religions of India and China.

Under the double influence of the Renaissance on the one side, and of the discoveries and tales of travellers and missionaries in Asia and the two Americas on the other, remarkable progress was made in the seventeenth century in discovery and knowledge of the religions of Asia; but still this knowledge was most fragmentary. The Jesuit missionaries gave some notions, for the most part erroneous, of Pegu, Siam, China, and Japan, but nothing as yet of India. The first publications also, on geography and the different religions, were extremely imperfect. It is, however, interesting to look over the works of Sansovino (1611), *Le gouvernement et administration des états et des républiques*. But Sansovino gives no place to religion, although he devotes several chapters to Turkey, Persia, and Egypt. And Davity, in his work *états et empires du monde* (1626), which gives the origin of all religions which had existed in the world down to that time, includes religion among the forces of each state. It is treated as such for England, Scotland, Ireland, France, Spain, Portugal, China, Japan, Pegu, Turkey, the Portes of Calcutta and Narsinge, the empire of the priest Jean Monomotapa, the kingdoms of Congo and Morocco. For European countries Davity gives no figures for comparing the different religions or sects. He gives statistics only concerning the parishes and revenues of the churches. He had only very vague and inexact ideas concerning India and Africa, but his book contains some curious information, gathered from the missionaries: (1) As to the progress of Christianity in the Portuguese colonies of Asia; (2) concerning the religions of Indo-China, and the religious orders of Siam and Cambodia; (3) concerning the four religious orders of China; and (4) concerning the extent and importance of Mohammedanism. The work of Davity holds, therefore, in the history of the statistics of religion an honorable

place. It is remarkable that Davity had learned at that time that there existed four religions in China.

In the second edition (1660) of Davity's book, by Recolles, more exact information was given in particular concerning China. Mention is made of Confucius, Fotoqui, and Sciinto. This is perhaps the earliest mention relating to Buddhism and the primitive religion of Japan.

The work of Alexander Ross (1666), *Les religions du monde*, although more special than that of Davity, borrowed much from him. All religions are passed successively in review, but without order, either chronological or geographical. The same chapter treats of the religions of Africa, America, and Armenia. There is no information concerning India, but some details are given about the monks of Siam and Pegu, and the three great philosophers of China.

To this epoch belongs the book of Palladius (London, 1668), *De gentibus Indiae et Brahmanibus*. In this work Palladius collects all references to the Brahmans from Greek and Roman historians and geographers. Probably Descartes, Pascal, Bossuet, Leibnitz, Newton, and Spinoza knew no more than this of the Brahmans. A few vague and general ideas were circulating in Europe concerning them, but no real information was given until the end of the eighteenth century. The dictionary of Moreri (1672), however, contained some reliable information with regard to Sakia, the great prophet of Japan, born 1029 B.C., in the island of Ceylon. In the article on *Religions*, countries are classed as Christian, Mussulman, or idolatrous.

The eighteenth century opened with several important works from different points of view, the *Political Arithmetic* of W. Petty (1698); the dictionaries of D'Herbelot and Bayle (1698-1697). The work of Petty, admirable in treatment of the method of collecting and comparing facts, contains no application of this method to religious facts. The dictionary of D'Herbelot makes brief mention of the philosophy of the Hindoos, according to which Brahm is the

first of three beings whom God made, and by whom, according to their doctrine, the world was made. This Brahm gave to the Hindoos the book which they call Bed, or Beth. This is one of the earliest references to the Vedas.

Bayle's dictionary shows remarkable progress. In the article *Brahmans* he clearly distinguishes the Brahmans of India from the Brahmins of China; and his information concerning Buddha and Buddhist doctrines, notably that of the Karma, is accurate. He gleaned his ideas of Buddhism from the narratives of La Loubère and Father Tachard. He established a very curious comparison between the extent of Christianity and Mohammedanism. He admitted that the extent of Mohammedanism was greater, and though he was deceived in this particular, the comparison is not less apt.

The great historical atlas of Gueudeville belongs to this period (Amsterdam, 1705). This is a collection, in the style of the atlas of Lesage and Kruse, of interesting dissertations and charts. Religion is mentioned in the chart of each country but without figures.

Up to the time of the publication of the works of D'Anquetil-Duperron (1771 and 1798) and the establishment of the Asiatic Society of Calcutta (1783), little progress was made in the knowledge of the religions of the extreme Orient. The memoirs of Fréret, and even those of Guignes, inserted in the works of the Academy of Inscriptions and Belles-Lettres, although throwing some light upon the subject, were still insufficient to convey any accurate idea to the world of letters. Fréret still confused Brahmanism and Buddhism under the common name of the religion of the Hindoos. Guignes even exaggerated this confusion. He asserted, as did D'Herbelot, that the Brahmans had taught Confucius. Knowing this, it is easy to account for some of the articles by Voltaire and the encyclopædists upon religions.

The works of De la Croix, Dupuis, and Dulaure, although specialists in the study of religions, still leave much to be desired as concerns any actual knowledge of the religions of Asia.

That there have been and are great religions which have a powerful influence upon mankind De la Croix, Dupuis, and Dulaure all agree, and their works are evidence that in the eighteenth century religions were reckoned as a distinct element of civilization. But the scientific resources of their age did not permit an exact knowledge of the religions. One finds in the historical dictionary of religious sects edited by De la Croix articles upon Christianity, Mohammedanism, and Zoroaster, the polytheistic beliefs of the Graeco-Romans, but nothing of Brahmanism. In the first volume of his work, *Origine de tous les cultes*, Dupuis attempted a sketch of religious geography, in which, however, he did not even use the work of Fréret and Guignes. The volumes relating to the worships of Greece, Rome, and Egypt are good, but those relating to Christianity are without value. The most useful part of Dupuis' work relates to the different religions of the tribes of Spanish America. Dulaure's work on the faiths which have preceded idolatry has much merit, but he treats only prehistoric religions. In the last chapter of *Ruines*, Volney makes a sort of division of the different religions of the world. Moses, Zoroaster, Brahminism, Buddhism, Mohammedanism, and Christianity have each a special chapter, and are each assigned a special place. But Volney did not have at his disposal the elements of knowledge necessary to decide where each belonged.

At the close of the eighteenth century (1792) appeared *Parallèle des religions* by Brunet. Although he made use of the works of his time, he did not succeed in giving a clear idea, or in making an exact catalogue, of the religions of which he treats. He includes, too, under one vague title of "Modern Paganism," the religions of Asia, among which he distinguishes the religions of Persia, the Ganges, Thibet, China, Japan, and the Tartars. A special section is devoted to ancient Paganism, Mohammedanism, Judaism, and Christianity. These religions are compared, but no statistics are given.

A résumé of the progress of the eighteenth century in the knowledge of the religions of the world shows that, while the educated knew that there existed, or had existed, many great religious faiths, its knowledge of the nature of the faiths themselves was very inaccurate and limited.

The conquest of India by the English, and of Egypt by the French, were the two events contributing the most to lift the veil which still obscured the knowledge of the religious development of mankind. The conquest of Egypt was followed by discoveries which made the study of the religions of Egypt, Assyria, Phœnicia, and Chaldea possible. The conquest of India had a still more important result. It is to this fact that the knowledge of Brahmanism and Buddhism is due.

It does not follow that even these discoveries and voyages, or the scientific works which marked the close of the eighteenth and the beginning of the nineteenth century, changed immediately the ideas of scholars concerning the religions of the world.

Thomas Pinkerton, in his *Modern Geography*, a work far superior in method to its predecessors, possessed most confused ideas in regard to the religions of India and China. For example, Fo, one of the gods of China, he considered to be the Buddha of Hindostan. In the first edition of Malte-Brun (1810), a geographer still more scholarly, the conclusions concerning the religions of the East are confused and contradictory. In 1826, in several celebrated papers in the *Globe* on the religious future of mankind, Jouffroy embraced under the term Brahmanism all the different religions of India and China. The great work of Benjamin Constant was no more satisfactory. Finally, due to the works of L'Anquetil-Duperron, Jones, Colebrooke, Schlegel, Creuzer, Lassen, Ritter, Burnouf, and others, more exact ideas were spread through Europe, and some attempt to compile statistics of religions was made. Between 1810 and 1836 several of these compilations were published. That of Malte-Brun in 1810 was perhaps the earliest. The following table illustrates the various estimates which were made : —

Religions.	Malte-Brun, 1810.	Gruberg, 1813.	Pinkerton, 1817.	De Cassel, 1817.	Balbi, 1829.	Allgemeine Kirchenzeit, 1831.	Malte-Brun, 1838.
Christianity....	220	238	235	252	260	234	260
Buddhism.. ...	150	150	180	316	170	169	200
Brahmanism...	60	60	60	141	60	125	70
Confucianism..	...	...	...	...	...	5	110
Islam.....	110	120	120	120	96	125	110
Jewish.....	5	5	5	4	4	2	5
Fetichism.....	...	...	...	...	...	115	140
Total.....	545	571	600	833	500	775	895

These figures are only very approximately correct. There is remarkable agreement in the estimates of Christianity, Brahmanism, Mohammedanism, and Judaism, but they vary greatly in regard to Buddhism, and as for the religions of China they are valueless. They give no place to the religion of Lao-tze, or to the worship of Ancestors.

Since 1830 the researches of Klaproth, the works of Schopenhauer, the studies of Lassen, Burnouf, and Spence Hardy have drawn more specific attention to Buddhism. The idea was soon advanced that Buddhism held the first place among the religions of the world, and Xavier Raymond, Dubois de Jancigny, Garcin de Jassy, and, finally, Renan soon adopted it. It was also held by the eminent Orientalist Rhys Davids, author of the article on *Buddhism* in the last edition of the *Encyclopædia Britannica*. Schopenhauer, who did much to make known, if not the truth of Buddhism, at least some of its tendencies, prepared statistics to show the great numerical superiority of Buddhism.

The geographers who recognized the necessity of furnishing statistics of religion fell in with these new ideas, as is clearly shown in the two following tables. The first is published in a work by M. l'Abbé de Broglie, on the history of religions, while the second is compiled from recent publications.

Religion.	Cortambert.	Hübner.	Petermann. 1857.	Abbé Martin. 1880.	Meyer.
Christianity.....	325	470	334	350	395.0
Buddhism.....	400	500	400	450	} 740.0
Brahmanism.....	200	150	200	200	
Mohammedanism.....	120	80	160	130	
Jewish.....	5	6	5	5	4.7
Various.....	150	256	200	....	116.5
Total.....	1,200	1,462	1,299	1,135	1,428.2

In this table the various religions of China are confused under the name Buddhism.

The following table shows later estimates : —

Religions.	Kuénen. 1882.	Schlagenweitt. 1882.	Rhys-Davids. 1884.	Spofford. 1881.	Block. 1888.	Berghaus.
	<i>millions.</i>	<i>millions.</i>	<i>millions.</i>	<i>millions.</i>	<i>millions.</i>	<i>per cent.</i>
Christianity....	400	335	327	388	....	30.7
Buddhism.....	450	341	500	340	400	31.2
Brahmanism....	....	160	160	175	100	13.4
Confucianism..	....	....	155	80	....	....
Islam.....	175	....	....	201	100	15.7
Jewish.....	....	....	....	7	....	....
Polytheism....	....	....	101	....	....	8.7
Sintoism.....	....	....	....	14	....	....
Total.....	....	....	1,243	1,205	....	99.7

In this table the estimates of Kuénen, Schlagenweitt, and Block do not present totals; that of Rhys-Davids has no sufficient basis for reckoning; while the system of proportion which Berghaus advances has been demonstrated by Max Müller as inaccurate.

We are thus led to inquire as to the basis and conditions necessary to establish reliable, scientific religious statistics.

The lack of agreement in the estimates of the preceding tables, although prepared for the most part by competent judges, indicates that the methods followed in their compilation were deficient. A better method was adopted by M.

Maurice Block, in *Théorie de la statistique* (1886), in considering each country in Europe separately. He thus arrived at fairly accurate conclusions.

This method should be vigorously followed, and is that which is here adopted. It is not without difficulties, but they are surmountable. In fact, religious statistics have shared in the general advance of statistics in our century. Most governments have recognized the necessity of possessing and preparing exact statistical information concerning the interests with which they are charged. Many admit religion — and they are to be congratulated — as among these interests, and consequently are provided with statistics upon this as upon other subjects far more exact than those compiled by individuals.

To these official records may be added those which the different sects themselves furnish. In this respect the superiority of the Christian nations is at once evident, since many of the ordinary occurrences of human life have for it a religious significance, and as such have a place in statistical registration as in baptism, marriage, and interment. In Christian countries these records are not the only means furnished by a church for verifying the extent of a given religion in any country, though they are always the most exact. Very interesting estimates may be reached by estimating the number of priests and churches, the seating capacity of the latter and the amount of the contributions.

In the case of other religions certain ceremonies enable the student to obtain valuable information, notably the obligatory presentation of the new-born infant at the mosque as by the Mohammedans, the investing with the tonsure among the Hindoos as in the Sudra caste, and the records of the family genealogy carefully inscribed on tablets on the altar to the ancestors among the Chinese.

It should be added that the great nations of Asia are naturally much better known today than during the last century. The English government has prepared the record

of religious history in India, while the Empire of China has been canvassed by travellers whose evidence we may compare and weigh. In the two Americas and Australia, Christianity being practically the only religion, the difficulties presented to the statistician are very few. In Africa the obstacles are much more serious. Finally, the population of the different countries of the world, an essential element in all religious computations, has been recently treated in the scholarly survey by Lavasseur, before *l'International Institut de Statistique*. It is to be observed, however, that there is a notable difference of opinion concerning the population of China, representing a fourth of the human race.

Religions differ not only in the number of their adherents, but also in their degree of universal distribution over the globe. In order, therefore, to give an accurate account of the extent of a religion, it is necessary to consider its territorial distribution, that is, its capacity for wide adoption. This fact cannot be too strongly insisted upon in a consideration of the relative importance of the great religions, and study of the following facts should correct many inaccuracies in statistical tables.

1. The Christian religion occupies almost exclusively, and but little outside, Europe, America, and Australia, over an area of 60 million kilometers, with a population of 477,000,000, not including territories and populations which it can claim in Africa and Asia. None of the other great religions shows such a universality of character except, possibly, Judaism, and consequently none has a comparable sphere of action.

2. The chief inquiry in the preparation of a statistical religious table concerns the distribution of the religions of Asia, Africa, and Oceanica.

3. Christianity is not only the most important religion, but also that in which divergent tendencies are most pronounced, producing sects and sub-sects, of whose extent and character statistics should give an account.

4. Divergent tendencies of the same nature, though less

characteristic, are seen in Mohammedanism, Brahmanism, and Buddhism; but the resources of statistics do not admit of estimating their relative importance. Such in Mohammedanism are the Musslemen Sunnites, and Chyites; in Brahmanism or Hindooism, the sects of Vishnu and Siva; and in Buddhism, the Buddhists of the North and of the South. For other religions the separation is not so violent nor important as that of the Catholic and Protestant churches of Christianity.

5. From preceding considerations it is evident that the study of religious statistics should begin with an examination of the religions in Asia, for there all the great religions meet on a common ground, and beyond it the influence of several does not extend.

EXTENT OF RELIGIONS OF ASIA.

Asia, with an area of 42,000,000 sq. kil., is inhabited by a population of 795,000,000, divided into four groups.

1. The Northern, dependent upon the Empire of Russia, with 60,000,000 inhabitants.
2. The Western, with a population of 33,625,000, including the provinces of the Ottoman Empire, Arabia, Persia, Kafiristan, Afghanistan, and Turkestan.
3. The entire Indian group, with a population of 259,000,000.
4. The Eastern group, consisting of China, Indo-China, and Japan, with 487,000,000 inhabitants.

In a general way, a distinct great religion apparently coincides with each of these territorial groups: Christianity to the North; Mohammedanism to the West; Brahmanism or Hindooism to the Central; and Buddhism to the Eastern group. This division has been the source of many errors. In the first place Mohammedanism has spread over all parts of Asia and throughout has a large following; the same is true of Christianity though in a much less degree. Secondly, there exist in the fourth or Eastern group, the vast world of China and Indo-China, other religions than Buddhism. These are: 1st,

the worship of Ancestors spread throughout China, and the Eastern neighbors of China; 2nd, the State Religion, or Confucianism; 3rd, Taoism, or the religion of Lao-tze. The Chinese have a saying that the three religions make but one. Nevertheless, there is no real likeness between them. The chief religion is always the worship of Ancestors, upon which is based the social order of China. Each family has its altar to its ancestors, and there it worships. Confucianism is the official religion of letters. As to Taoism, it is a special religion running parallel with the progress of Buddhism in China. Buddhism is not included in the San-kiao-y-kiao, where the three religions are made one.

Long and difficult study and travel have been necessary to distinguish these four religions of China. In the first volume of *Chips from a German Workshop*, Max Müller insisted upon recognizing the different religions of China. Rhys-Davids, Reclus, Edkin, and Beal, however, have persisted in finding only Buddhists in the fourth group, and thus made Buddhism the principal religion of the race. More recent and competent writers on China, such as Legge, Douglas, Williams, Wilson, and Cordier have accepted the opinion of Max Müller. The weakness of Buddhism is shown by Péro Huc and M. Escayrac de Lauture, while the traditions and religious habits of the population, the number of temples, the importance of the worship of ancestors, which has been recognized by E. Reclus, leave no longer a doubt. If doubts still existed they would be dissipated by the work of Monier Williams, devoted to Buddhism (London, 1889). "Professor Legge informs me," he says in a postscript to the preface, "that Dr. Happer, a Presbyterian missionary who has lived in China for forty-five years, and who knows thoroughly the statistics concerning Buddhism, counts in China only 20,000,000 Buddhists, and 72,500,000 in all Asia. Dr. Happer says that if the Chinese are called upon to classify themselves as Buddhists, Taoists, or Confucianists, nineteen-twentieths claim the title of Confucianists." Mr. Williams thinks that the whole number of Buddhists does not exceed 100,000,000.

Finally, the recent publication of religious statistics of Japan, where the faith of the population can be determined by the number of temples and priests, the complete distinction of the religions (Shintoism and Buddhism) not only confirms the opinions of Williams, Legge, Wilson, and others, but give a basis for making the first division of the population of China according to religion. Two-thirds of the temples can be attributed to Confucianism and the worship of Ancestors combined, and the other third is equally divided between Buddhism and Taoism.

We are now prepared to present a table of statistics for each of the great religions of Asia, using for this work the statistics of the Catholic and Protestant missions, the governments of India, Japan, and Russia; the works of Reclus, Medhurst, and Williams; statistics of the *Gotha Almanac*, *Statesman's Year-Book*, works of Kolb, and the articles on the *Catholic Church*, *Protestants*, *Russia*, *Buddhism*, *China*, *Brahmanism*, in the last edition of the *Encyclopædia Britannica*.

I. Christian.

CATHOLIC MISSIONS.

India,	1,198,569
China,	1,115,681
Turkey,	663,000
Asiatic Russia,	70,000
Japan,	30,000
	<hr/> 3,077,250

PROTESTANT MISSIONS.

India,	534,250
China,	88,500
Turkey,	20,000
Asiatic Russia,	20,000
	<hr/> 662,750

ARMENIANS, 1,690,000

JACOBITES, 70,000

ORTHODOX GREEK.

Turkey,	1,620,000
Syria,	50,000
Palestine,	150,000
Asiatic Russia,	7,900,600
	<hr/> 8,820,000

NESTORIANS, 80,000

Total, . . . 14,400,000

II. Mohammedan¹.

India,	50,121,595 ²
China,	21,000,000
Persia,	7,700,000
Cashmere,	1,335,000
Afghanistan,	4,000,000
Belouchistan,	350,000
Independent Tartary, . . .	2,800,000
Kafiristan,	500,000
Arabia and Oman,	2,102,000
Asiatic Russia,	7,500,000
English Possessions, . . .	120,000
Asiatic Turkey,	12,012,000

Total, . . . 109,540,595

¹ Estimate of Dabry de Thiersant.² Sir Monier Williams estimates 55,000,000.

III. Brahmanism or Hindooism.

Official statistics of India give the exact number of Hindoos, who are members of some one of the sects included in the name of Hindooism, as 187,937,450. Sir Monier Williams estimates it at 200,000,000, claiming that other religions of India rapidly give way in favor of one of the three sects of Hindooism,—the sects of Siva, Vishnu, and Krishna.

These groups are estimated as follows:—

Aboriginal religions,	6,246,511
Sikhs,	1,853,426
Jains,	1,221,885
Parsees,	85,597
Scattered,	952,039
Total,	10,539,458

The Parsees represent the survival of one of the great religions of mankind, Mazdaism.

IV. Buddhism. This has not the stability of other great religions, such as Christianity, firmly seated in Europe, America, and Australia; or of Hindooism, master of India; or of Mohammedanism and the Worship of Ancestors, masters of China. It has two hearths, one in Thibet and the other in Indo-China, in the centres of subject populations. In China it has only a secondary importance. As travellers have encountered its pagodas and its priests throughout the East, a considerable population has been credited with this religion which do not belong to it.

Buddhists of the North.		Buddhists of the South.	
Thibet,	6,000,000	Ceylon,	1,700,000
Burhma,	5,400,000	Siam,	5,800,000
Nepal-Assam,	1,500,000	Tong-Quin,	6,000,000
Mongolia,	2,000,000	Cochin-china,	2,200,000
Cashmere,	200,000	Cambodia,	1,000,000
Asiatic Russia,	600,000	Settlements,	600,000
China,	84,000,000	Annam,	6,000,000
Total,	99,700,000		23,300,000
		Buddhists of the North,	99,700,000
		Total,	123,000,000
		Buddhists of Japan,	24,900,000
		Grand total,	147,900,000

By these calculations we arrive at a larger result than that of Monier Williams, who possibly did not include the Buddhists of Japan.

V. The Worship of Ancestors and Confucianism. As has been already indicated, the Worship of Ancestors is the true religion of China. It is also the official religion, while the Chinese enter indiscriminately into all the temples of the Buddhists and Taoists to burn their incense or bring their flowers. A very small number of them assist in the ceremonies, while all perform the rites due to the Ancestors, regarding the Emperor as the Son of Heaven, and worshipping Confucius. It is important not to depreciate the influence of the Worship of Ancestors and Confucianism in order to magnify that of the true Buddhists and Taoists. Consequently, with at least 256,000,000 followers, Confucianism and the Worship of Ancestors becomes the second religion of mankind.

VI. It is necessary also to give a place to the sect of Lao-tze. This possesses many temples in China; and its priests and ceremonies are entirely distinct from those of Buddhism. The number of followers of this philosopher is estimated at 43,000,000.

VII. Shintoism. This is the ancient religion of Japan. It includes 14,000,000 followers. According to an estimate prepared by the government of Japan, which made a record of the number of temples and priests of Japan on December 31, 1884, Shintoism possessed 14,613 priests, and 16,092 preaching priests, with 190,418 temples. The Buddhists counted 130,573 priests and 72,017 temples. Taking the mean proportional between temples and priests, Shintoism is reckoned at 14,000,000 and Buddhism at 24,900,000.

VIII. Judaism. The Jews who have exercised so great an influence upon the religious development of mankind have almost abandoned Asia; they number there no more than 200,000. The religious statistics of Asia, according to the most recent estimates, are summarized as follows:—

1. Religion of China, or Ancestor-Worship and Confucianism, . . .	256,000,000
2. Hindooism, or Brahmanism,	120,000,000
3. Buddhism,	147,900,000
4. Mohammedanism,	109,500,000
5. Taoism,	43,000,000
6. Christianity,	14,400,000
7. Shintoism,	14,000,000
8. Judaism,	200,000
	<hr/> 775,000,000

If the population of Asia is estimated at 790,000,000, there remains 15,000,000 which belong to the different religions of India, Manchuria, Corea, and Indo-China, concerning which no information is as yet received. The very inferior position of Christianity in Asia, her birth-place, should be noted.

RELIGIONS OF AFRICA.

For the continent of Africa the following approximate estimates are presented:—

Christian,	7,400,000
Musulmen,	36,000,000
Polytheists or Fetich Worshippers,	97,000,000
	<hr/> 140,400,000

The Christians are divided into—

The Church of Abyssinia,	3,000,000
Catholic Church, North Africa,	497,030
“ “ Western Africa,	1,026,950
“ “ Eastern and Central Africa,	38,000
“ “ Islands of the Indian Ocean,	296,940
“ “ Islands of the Atlantic Ocean,	796,000
Protestant Churches,	1,744,080
	<hr/> 7,400,000

There are 400,000 Jews in the various sections of Africa.

OCEANICA.

The distribution of religions in Oceanica, with estimated population of 38,161,734, is estimated as follows:—

Christians,	9,119,282
Musulmen,	24,669,787
Polytheists or Fetich Worshippers,	4,372,665

Of the Christians 6,574,481 are Catholics and 2,724,801 are Protestants. The Catholics are distributed as follows:—

Philippine Islands,	5,502,000
Dutch islands	400,915
Polynesia,	80,600
New Zealand,	68,984
Australia,	521,982

STATISTICS OF THE RELIGIONS OF AMERICA.

Christianity possesses the continent of America, where the population is increasing with the greatest rapidity, now exceeding 112,000,000. With the exception of the worship of a few savage tribes, Christianity has replaced all the ancient religions of Mexico and Peru; and it is also noticeable that other religions, as Mohammedanism particularly, in spite of its ubiquity, have obtained no foothold. Besides being almost entirely Christian, America is divided in very equal proportions between two of the three great Christian churches. Subtracting from the 112 millions of people in America those who are non-Christian, there still remains more than 110 millions of Christian population. The non-Christian groups are:—

Inhabitants of Greenland,	10,000
Inhabitants of Arctic regions,	58,446
Indians of the United States,	212,658
Savages of Brazil,	600,000
Savages of Paraguay,	130,000
Savages of other states,	300,000
	<hr/> 1,309,104

According to the Atlas of the Catholic Missions, made with great care in America, the Catholic church includes —

In the United States,	8,000,000
In Canada,	1,796,882
In Central America,	15,329,000
In South America,	27,268,000
	<hr/> 52,393,882

It is now estimated that there are 58,000,000 Catholics and 57,000,000 Protestants in America, 50,000,000 of whom are classed as such in the United States, 3,000,000 in the Dominion of Canada, and 4,000,000 in Central and South America.

RELIGIOUS STATISTICS OF EUROPE.

With the exception of an altogether secondary group of Mussulmen and Jews, found in Europe, the only religion of

Europe is Christianity. But, instead of being subdivided, as in America, into two great divisions, in Europe there are three, each of which has many adherents, covering a large extent of territory. The result of these estimates, which are highly reliable for Europe, shows that the Catholic church equals the two others—the Protestant and Orthodox churches—combined; that the extent of these two is about equal; and that the Israelites and Mussulmen hold positions of equal importance.

RELIGIONS OF EUROPE. IN THOUSANDS.

	Population. 1888.	Catholic Church.	Protestant Churches.	Orthodox Church.	Jews.	Mohamme- dans.	Religion not stated.
Russia.....	93,000	9,600	3,400	73,310	3,400	3,000	290
Germany.....	47,200	17,100	29,478	.....	590	.....	32
Austro-Hungary....	39,900	31,100	3,900	3,100	1,700	.....	100
France.....	38,300	35,387	580	.....	40	.....	84
United Kingdom....	37,200	6,500	30,100	.....	100	.....	500
Italy.....	30,000	29,850	62	.....	38	.....	50
Spain.....	16,900	16,850	29	.....	5	.....	.....
Belgium.....	5,900	5,880	15	.....	3	.....	2
Roumania.....	5,400	100	15	4,800	400	30	55
Ottoman Empire....	4,900	320	11	1,700	60	2,708	70
Netherlands.....	4,400	1,545	2,756	.....	83	.....	16
Portugal.....	4,400	4,300	.....	.....	.....	.....	1
Sweden.....	4,700	1	4,698	.....	2	.....	1
Switzerland.....	2,900	1,172	1,710	.....	8	.....	10
Denmark.....	2,100	3	2,089	.....	4	.....	4
Greece.....	2,000	10	10	1,830	5	45	.....
Servia.....	2,000	6	1	1,973	5	15	.....
Bulgaria.....	2,000	29	.....	1,393	.....	571	.....
Norway.....	1,960	1	1,958	.....	.....	.....	1
Roumelia.....	976	30	.....	700	4	240	2
Montenegro.....	300	5	.....	290	.....	.....	1
Luxembourg.....	200	200	.....	.....	.....	.....	.....
Malta.....	160	160	.....	.....	.....	.....	.....
Gibraltar.....	16	16	.....	.....	.....	.....	.....
Total.....	346,812	160,165	80,812	89,196	6,456	6,629	1,219

COMPARATIVE TABLE OF RELIGION.

The following table is a résumé of the preceding estimates. Religions are classed in order of importance, and by branches of the race. Christianity represents at least one-third of the race, and the Semitic-Aryan branch, to which it belongs, represents at least one-half. The other half is quite equally divided in two parts, — the Aryan branch, including the two great religions which arose in India, and the Chinese branch.

Although inaccuracies are inevitable, it is safe to say that in the estimates of Christianity and its subdivisions, Mohammedanism, Judaism, Hindooism, and Shintoism the error cannot be large. It remains to discuss the division of the population of China among the different religions found there. But one point at least is gained; it is no longer possible to consider the 382 millions of inhabitants of China as Buddhists. Upon this point the decisive observations made by Max Müller twenty-five years ago have borne fruit. Buddhism, which is essentially a monastic association, loses thus the place which had been wrongly assigned to it.

The immense superiority of the Semitic-Aryan branch is striking, and it corresponds with the direction of civilization. Christianity and Mohammedanism alone still enjoy the vigor of proselyting which characterizes living religions. The Worship of Ancestors and Confucianism, as well as Hindooism, lack the power of expansion necessary for universal religions.

DISTRIBUTION OF THE GREAT RELIGIONS.

Semitic Aryan Race.					Aryan Race.		Chinese Race.		Polythelism.
Christianity.					Hindooism.	Buddhism.	Worship of Ancestors and Confucianism.	Taoism.	
Catholic Church.	Protestant Churches.	Orthodox Churches.	Mohammedanism.	Judaism.					
Europe.....	80,812,000	80,136,000	6,623,000	6,466,000					
America.....	58,383,882	57,294,014							1,369,004
Oceania.....	6,574,481	2,724,781	24,698,787						4,372,665
Africa.....	2,655,920	1,744,080	36,000,000	400,000					91,000,000
Asia.....	3,007,250	662,750	100,535,585	200,000	190,000,000	147,900,000	256,000,000	43,000,000	15,000,000
Total.....	230,866,533	143,237,625	98,016,000	7,066,000	190,000,000	147,900,000	256,000,000	43,000,000	117,681,669

Christianity.	Total.	Classed by Religions.		Number.	Classed by Races.		Number.
		1. Christianity.	2. Worship of Ancestors and Confucianism.		1. Semitic Aryan.	2. Aryan.	
Catholic church.....	230,866,533			477,080,158			600,970,530
Protestant churches.....	143,237,625			256,000,000			337,900,000
Orthodox church.....	98,016,000			190,000,000			209,000,000
	472,120,158			176,834,372			
Church of Abyssinia.....	3,000,000	3. Hindooism	4. Mohammedanism	190,000,000	3. Chinese		
Coptic church.....	120,000	5. Buddhism		147,900,000			
Armenian church.....	1,690,000	6. Taoism		43,000,000			
Nestorians.....	80,000	7. Shintoism		14,000,000			
Jacobites.....	70,000	8. Judaism		7,066,000			
		9. Polythelism		117,681,669			
	477,080,158						

NET PROFITS OF MANUFACTURING INDUSTRIES IN THE STATE OF MASSACHUSETTS.

Twenty-first Annual Report of the Bureau of Statistics of Labor of Massachusetts, March 1, 1891. Part IV. Net Profits in Manufacturing Industries. Pp. 261-630.

BY FREDERICK B. HAWLEY.

The proportions in which the annual product of any community is ultimately divided among those who created it is an abstruse and difficult matter, as every one who has given much attention to the problem is aware. The difficulties have, indeed, been so obvious that it is only recently that endeavors have been made to collect the data necessary for investigation. Errors in the first attempts to resolve an abstruse problem, concerning which nearly everybody has more or less of a personal bias, must be leniently regarded, and, however we may judge of his final conclusion, we must remain thankful to Mr. Wadlin for the fund of laboriously gathered information he has laid before us.

It is no part of my purpose to call in question the reliability of the original data upon which the conclusions of the Massachusetts report are based. About them, although now and then a pregnant suspicion may arise, outsiders have no sufficient opportunity of judging. What I hope to show is that the final conclusions, really indicated by these data, are very different from those obtained by Mr. Wadlin. I hope, therefore, no one will quote me as positively affirming the correctness of the conclusions I arrive at, though they do appear to me as not at all improbable. All I claim for them is that they are approximately those indicated by the original data furnished by the Report. To the extent these data are incorrect my conclusions must also be erroneous.

This question of distribution can be regarded from two very distinct points of view,—the social and the economic. From the latter incomes must be discriminated according to their real character. From the former, the social class, to which the recipient of the income belongs, is the important thing. Thus, lawyers, doctors, artists, and most of those in receipt of salaries, belong socially to the moneyed classes, while, in economic statistics, they must be ranged with other laborers. So, also, if we are considering the social relations of employers and employees, such part of the former's income as is the result of their own labor must be looked upon as part of the income of the class, whereas in economic investigations it must be regarded as

wages. It is, of course, perfectly legitimate to base statistical investigation upon either standpoint, but it is not legitimate to use both bases in the same investigation, or to apply social conclusions to economic data, or the reverse. It appears to me that Mr. Wadlin has fallen into both of these errors. He states his problem as one of Economics. "What are the actual shares of labor and capital in the product to which each has contributed?" And he is careful to define both labor and capital strictly in their economic sense. Now, there is only one method of division that could possibly occur to anyone really grappling with this as a question of economics. He would necessarily seek first to find out how much of the final value was due to other industries, contributed, as it were, from the outside, and therefore not resolvable into its component parts. The remainder of the product would be added value, and this he would proceed to distribute as well as he could, in wages, rent, interest, and profit; discriminating, very likely, salaries from wages, so that his economic results would be capable of social application.

Mr. Wadlin proceeds on a very different plan, because, while professing to study the matter from the economic standpoint, he really adopts the social point of view. That is, instead of attempting to discover what capital, as a whole, gets out of the product, he tries to find out what is obtained by such of the capitalists as happen also to be employers of labor. Then, having obtained this, at best only a social fact, he steps back on his economic platform and proceeds to use his social fact as a basis for economic deductions. Not only are conclusions, so derived and used, invalid, but the form of the tables in the Report suffers from this scientific strabismus. In his "Cost of Production," which should correspond to what I have spoken of as the value extrinsically contributed, are to be found such items of added value as salaries, wages, rent, new equipment, and taxes. In his "Excess of Selling Price above Cost of Production" are found the items of depreciation, selling expenses, and losses by bad debts; all really elements of cost. He includes, under "Net Profits," what employers receive as compensation for their own labor. And, finally, he computes the part of "Net Product" to be apportioned to interest, not on the whole capital engaged, as should have been done if interest and profit were to be scientifically discriminated, nor on the amount of borrowed capital, as would have been in accordance with ordinary business usage, and also in accordance with the employer's standpoint,

but on what he calls "Cash and Credit Capital,"—that is, the circulating capital engaged. In this he is not even consistent with the point of view (that of the employing class) he has disclaimed but unconsciously adopted.

Now, it may be said that these theoretical objections to the form of the tables in the *Massachusetts Report* are trivial; that the figures are there and can easily be rearranged by the critical reader, who should not be misled by their bad arrangement. This is, in a measure, true, but it must never be overlooked that the great mass of readers are not critical, and that even critical readers should not be obliged to spend their time and labor in readjusting statistical tables. But, however this may be, it can hardly be contended that this neglect of form is a trivial matter when attention is called to the extent in which Mr. Wadlin himself has been misled by it. The last 230 pages of his report (more than three-fifths of it) are occupied exclusively with laborious calculations, based upon Gross Profits being 12.95 per cent, and Net Profits being 3.90 per cent of the selling price. Now, as I have already pointed out, his "Gross Profits" includes a good deal that must be reckoned among the elements of cost, from whatever point of view cost is considered. And the "Net Profits," which are calculated to be 3.90 per cent, should be, as appears from the tables given, 7.02 per cent from the social point of view,—7.02 per cent, less an allowance for unsalaried efforts and for interest on all the capital engaged, from the economic point of view; and 5.30 per cent from the employer's point of view, as then 1.40 per cent would have to be added for interest on the circulating capital not borrowed. This percentage of 3.90 is expressive of absolutely no relation of any kind, and the enormous labor expended in calculations, founded upon it as a basis, has been simply thrown away. And this serious misdirection of effort is the result of the defective form in which the data have been tabulated.

The value of the concluding 230 pages is negatived, however, not only because founded upon improperly classified facts, but also, as I hope to show, because the percentages, which serve as their basis, are by no means those yielded by a correct analysis of the original data.

I here reproduce from pp. 398–399 of the *Massachusetts Report* such portions of the final tables as are essential to the discussion.

ALL INDUSTRIES.

Classified Capital (23,431 establishments).	
Land, buildings, and fixtures.	\$118,886,643
Machinery, implements, and tools.....	115,254,330
Cash capital.....	173,440,947
Credit capital.....	93,012,457
	\$500,594,377

SELLING PRICE.

Classification as Regards Profit.	Number of Establishments.	Value of Goods Made and Work Done.	Percentage of Selling Price.
Making a profit.....	9,251	\$414,516,434	61.44
Not making a profit	762	52,416,619	7.77
	10,013	\$466,933,053	69.21
Not answering.....	13,418	207,701,216	30.79
	23,431	\$674,634,269	100.00

RELATION OF COST OF PRODUCTION TO SELLING PRICE (10,013 ESTABLISHMENTS).

Classification.	Percentage of Selling Price.
Stock used.....	58.91
Salaries.....	1.73
Wages.....	22.34
Rent.....	0.73
Taxes.....	0.56
Insurance.....	0.33
Freight.....	1.27
New equipment.....	0.24
Repairs.....	0.81
Other expenses.....	0.13
Excess of selling price above cost of Production.....	12.95
Total.....	100.00

DISTRIBUTION OF EXCESS OF SELLING PRICE ABOVE COST OF PRODUCTION (10,013 ESTABLISHMENTS).

Classification.	Percentage of Selling Price.
Interest, 5 per cent on cash and credit capital.....	2.15
Depreciation, 10 per cent on value of machinery, implements, and tools	1.90
Allowances for selling expenses and losses by bad debts, 5 per cent on selling price.....	5.00
Net profit.....	*3.90
	12.95

* Equivalent to 4.83 per cent on amount of capital invested.

For the convenience of the reader, I place here, in juxtaposition to the above tables, such tables as, it appears to me, a proper analysis of the original data really yields. The explanation of each modification of the figures of the Report will be found in notes and appendices, which, as they contain the reasons which explain the modifications the writer has ventured to make, and are essential to the understanding of his tables, the reader is requested to read in connection with these tables, and before passing on to what follows.

CLASSIFIED CAPITAL (23,335 ESTABLISHMENTS ENGAGED IN 63 INDUSTRIES, PRINT WORKS BEING EXCLUDED; APPENDIX A).

Land, Buildings, and Fixtures.....	\$114,322,572
Machinery, Implements, and Tools.....	111,659,289
Cash Capital.....	170,381,965
Credit Capital.....	88,039,141
Rented Land, and Buildings (estimated). (Appendix B.).....	65,000,000
Capitalized Value of Patents, Copyrights, Good Will, and Special Privileges (estimated). (Appendix B.).....	50,000,000
	\$599,402,967

SELLING PRICE (23,335 ESTABLISHMENTS; SEE APPENDIX A).

Classification as Regards Profits.	Number of Establishments.	Value of Goods Made and Work Done.	Percentage of Selling Price.
Making a profit.....	9,196	\$407,846,626	61.92
Not making a profit.....	752	46,134,650	7.00
	9,948	453,981,285	68.92
Not answering.....	13,387	204,772,141	31.08
	23,335	658,753,426	100.00

RELATION OF COST OF PRODUCTION TO SELLING PRICE (9,948 ESTABLISHMENTS PRINT WORKS BEING EXCLUDED; SEE APPENDIX A).

Classification.	Percentage of Selling Price.
Stock used*.....	57.65
Insurance.....	.33
Freight.....	1.27
Repairs. (Appendix C.).....	.81
Other expenses reported.....	.13
Depreciation (Mr. Wadlin's estimate). (Appendix C.).....	1.90
Selling expenses (estimated with Mr. Wadlin at 24 per cent, but some deductions allowed here). (Appendix D.).....	1.75
Contributed from outside.....	63.84
Added value.....	36.16
	100.00

* This table is not exact. The rectification of each item for the omission of Print Works involved so much labor that I did not undertake it, but deducted the aggregate change, 1.26 per cent, from Stock Used, as it was evident about all of it would be found there, the error in the Print Work returns being due to an excessive valuation of Stock Used. Moreover, the apportionment of the correction makes no difference at all in Added Value, which is the sum we have to deal with.

DISTRIBUTION OF ADDED VALUE (9,948 ESTABLISHMENTS).

Classification.	Percentages of Added Value.		
Loss by bad debts (estimated, in agreement with the Report, at 24 per cent, of which, for reasons given, only 1/3 of 24 per cent on added value is to be charged here) (Appendix E.).....	.62	.....
Taxes.....	.56	.....
Total to the state and to laborers who failed to pay their debts.....	.....	1.18	
Salaries.....	1.73	.....
Wages.....	22.34	.....
Total to employees.....	.....	24.07	
Personal services of members of private firms, 12,492, at \$600 each. (Appendix F.).....	1.65	.....
Rent.....	.73	.....
Interest (5 per cent on all capital except rented capital)*.....	4.06	.....
Total for use of capital.....	.....	4.79	
Invested profit (new equipment). (Appendix C.).....	.24	.....
Uninvested profit.....	4.23	.....
Total for risk of capital.....	.....	4.47	
Total to employing and moneyed classes.....	.....	10.91	
			36.16

* This is not exact. The Report does not give the classified items of capital for reporting establishments; consequently, I have been forced to use the rate that applies to the whole 23,335 establishments.

RELATION OF COST OF PRODUCTION TO SELLING PRICE (23,335 ESTABLISHMENTS, BEING ALL EXCEPT PRINT WORKS; SEE APPENDIX A).

Classification.		Percentage of Selling Price.
Stock used. (See note to similar table of 9,948 establishments).		57.65
Insurance.....		.33
Freight.....		1.27
Repairs.....		.81
Other expenses reported.....		.13
Depreciation. (Less, according to tables in the Report, for all than for reported industries.) (Appendix C.).....		1.71
Selling expenses. (Appendix D.).....		1.75
Less allowance for greater proportion of unreported establishments in the more profitable industries. (Appendix G.)....	.54	63.65
Less allowance for greater probable excess in selling price in establishments not answering. (Appendix G.).....	2.61	
	3.15	
Half deducted here and half from wages in following table....		1.58
Contributed from outside.....		62.07
Added value.....		37.93
		100.00

DISTRIBUTION OF ADDED VALUE (23,335 ESTABLISHMENTS, BEING ALL EXCEPT PRINT WORKS; SEE APPENDIX A).

Classification.	Percentage of Added Value.		
Loss by bad debts (see second table preceding). (Appendix E.).....	.....	.62	.....
Taxes.....	.....	.56	.....
Total to the state and to laborers who fail to pay their debts...	.....	.....	1.18
Salaries.....	1.73	.....	.....
Wages.....	22.34	24.07	.....
Less corrections, necessitated by including establishments that failed to report in full. (See preceding table.) (Appen. G.).....	.....	1.57	.....
Total to employees.....	.....	.....	22.50
Personal services of members of private firms, 29,302, at \$600 each. (Appendix F.).....	.....	2.67	.....
Rent.....	.73	.....	.....
Interest (5 per cent on all capital except rented capital).....	4.06	.....	.....
Total for use of capital.....	.....	4.79	.....
Profit reinvested in business (new equipment). (Appendix C.).....	.24	.....	.....
Profit not reinvested in business.....	6.55	.....	.....
Total profit for risk of capital.....	.....	6.79	.....
Total to employing and moneyed classes.....	.....	.....	14.25
			37.93

This latter table is as close an approximation of the percentages indicated by the original data as I have been able to reach. Some further analysis may be useful as a means of comparing the innate probability of the results obtained with those arrived in by the Massachusetts Report.

DISTRIBUTION OF ADDED VALUE.

Classification.	Per cent.
Taken by the state.....	1.48
Obtained without payment.....	1.63
Paid in wages and salaries.	59.32
Earned by unsalaried labor of employers..	7.04
Secured by capital.....	30.53
	100.00

Comparing the returns to capital and labor, if the item of earnings of employers is classed with wages, as must be done from the economic standpoint, then labor secures 68.49 per cent and capital 31.51 per cent of their joint product. If, on the other hand, we adopt the social point of view, and class these unsalaried earnings as part of the income of the moneyed classes, labor secures 61.22 per cent and capital 38.78 per cent of their joint remuneration. According to the tables in the Report, these latter ratios are 77.42 per cent to labor, and only 22.58 per cent to capital. As no estimate is made of the value of unsalaried labor, we cannot know what ratio would be given, as between all wages on the one hand and all other forms of income on the other.

My last table indicates that capital engaged in the manufactures of Massachusetts earns for its owners and temporary controllers 5 per cent in interest, and 7.46 per cent in pure profit. Owing to their faulty form, the corresponding percentages do not appear clearly in tables of the Report. The statement here is particularly confused. Interest is figured on only 52.34 per cent of the total capital, which would make the rate of interest only 2.77 per cent on all the capital engaged. The rate of profit is made 4.83 per cent of total capital, but in this calculation "New Equipment" and rentals have been excluded and included "unsalaried labor." Moreover, the Report

omits, as I have pointed out, two very considerable items of capital, amounting, according to my estimates, to \$115,000,000, although the returns to this capital must come out of the product under analysis. I do not attempt to untangle this skein, but simply dig out from the table the items that are really returns to capital, and add them together. They are Rent, 0.73 per cent; New Equipment, 0.24 per cent; Interest, 2.15 per cent; Net Profit, 3.90 per cent; making in all 7.02 per cent of the total product. This would give us 7.57 per cent as the total return to the capital engaged (rented and special privilege capital included). But this ratio includes the earnings of the unsalaried labor of partners in private firms, which, at \$600 each (certainly a very moderate calculation), would amount to 1.78 per cent on capital for the reporting establishments, and to 2.89 per cent for all establishments taken together. Now, what do these figures mean? Simply this, that in the reported establishments, after interest on capital at 5 per cent and the unpaid salaries of principals are allowed for, 0.79 per cent is all that can be squeezed out of the product for profit. In other words, those shrewd and cautious fellows, the manufacturers of Massachusetts, are accustomed to pay 5 per cent for money, in order that they may secure for themselves an additional three-quarters of one per cent, and a two-dollar-per-day job. And it is only the richer two-fifths who are able to do so well as this. If we take all of them together, we find them borrowing money at 5 per cent, not only without any profit but at an absolute loss of 0.32 per cent, in order to get a two-dollar-a-day job. What becomes of the poor fellows, from whom the banks extort 6 per cent, it would sadden the reader too much to contemplate.

Mr. Wadliu frequently assures us, without a perception of the inherent improbability of the statement, that the average Massachusetts manufacturer, employing a capital of \$10,701, after allowing for interest on his circulating capital, but without an allowance for interest on the permanent part of his investment, obtains but \$517 per annum as compensation for both his personal labors and the use of his capital. In other words, Massachusetts manufacturers would better their position very considerably if they would abandon their property and hire out, in a body, at two dollars per day each.

Now let us examine, in the concrete, the percentages afforded by my last table. We will take what the Report assures us is the average Massachusetts man who engages in manufacturing. We will

suppose him to possess the sum of \$10,701, invested in a business just ordinarily hazardous, and that he is possessed of just ordinary ability, and meets with just ordinary good fortune. According to my last table this average man would enjoy a yearly income of \$1,933.34 (of which \$600 would be wages, \$535.05 interest, and \$798.29 profit). Now, to use round numbers, would an active and competent business man, employing a capital of \$11,000, be looked upon as doing more than fairly well if his business yielded him no more than \$2000 annually? Would an active and competent business man of fair experience pay \$11,000 for a business (to which he intended to devote his whole time and efforts) which promised less than such a return as this? The appeal is directly to the readers' own common sense. Would you do it? And, if you are a business man and satisfied with your business, are you getting less or more than this proportionably to the size of your investment?

I think there can be but one answer to these questions, namely, that such a return would not even be quite satisfactory to the average man of business. How does it come about, then, that the popular idea of the return to capital is considerably below the percentage we have arrived at? There are, it appears to me, two principal reasons. People are apt to confound the average rate of profit with what economists call the lowest sufficient rate,—the rate, that is, which will suffice to keep in operation the worst managed capital required to produce the amount of the commodity effectually demanded. Those familiar, as most of my readers must be, with the writings of President Walker, do not need to be told that the average rate of profit may well be two or three times this sufficient rate. Secondly, the growth of corporate at the expense of private undertakings has been a marked feature of recent industrial development. As the rate of profit in incorporated companies has been often shown statistically to be below my figures, it may be hastily assumed that the rate enjoyed by private firms must be still lower than the rate enjoyed by corporations.* From theoretic considerations, for the rehearsal of which there is no room here, I have long been of the opinion that the real reason why cor-

* This is exemplified by occurrences, somewhat common recently, in which private businesses are incorporated with a capitalization, frequently 50 per cent, sometimes even 100 per cent, greater than the sum private individuals would give for the property for the purpose of continuing the business as a private firm. And yet the stock of such corporations will not only be placed at par but will continue to sell at par, if the business continues to do as well under corporate management as it did under private.

porate was supplanting private enterprise was not because it was more profitable, but because capital invested in corporations was satisfied with a much lower rate of return than when employed by individuals. It is gratifying, therefore, to find this opinion statistically confirmed by the original data the Report has laid before us; for it is there shown beyond question that businesses conducted in a small way are almost uniformly much more profitable than those conducted in large establishments. It will be readily appreciated how the contrary supposition could not fail to lead popular opinion astray as to the average of profit in all industries taken together.

But, while my results seem to agree fairly well with the commonly observed facts of daily life (while the results of the Report are sufficiently discredited by a similar comparison), I do not ask for their acceptance as authoritative. As I have already cautioned the reader to observe, they are no better than the original data allow. Every error in these data necessarily influences the results of their analysis. It is true that, to a certain extent, errors and mistakes tend to counterbalance each other, but it is altogether improbable that they will exactly or even nearly do this when they are at all considerable either in number and degree. Unfortunately, there are various ear-marks about the original data the Massachusetts Bureau has employed which can hardly fail to make us suspicious of their accuracy. Certainly, if they are accurate the operation of the economic law that profits tend to an equality is more impeded by temporary obstructions than we have been accustomed to suppose. The supposition that the rate of profit varies, according to the figures of the Report, is, as we have seen, not only contrary to sound reasoning, but also hard to believe, that the range of variations in the rate of profits is nearly as wide as is indicated by the analysis I have made.

Then, again, we cannot free ourselves from the suspicion that the same error, which proved so disastrous to the Print Works returns, has been committed to a lesser degree in the returns of other industries. Anyone carefully examining the subsidiary tables of the report can hardly fail to observe that the industries which exhibit an unexpectedly small "Excess of Selling Price above Cost of Production" are the very ones into whose returns errors of this kind would be most likely to creep.

Then, again, the item of New Equipment is so suspiciously small (only 0.24 per cent of the Selling Price) that we can assert almost

positively that many items which should have gone to it have been charged to "Stock Used," "Repairs," or "Wages."

A doubt also obtrudes itself (rising almost to a certainty in some instances) whether Selling Price covers Selling Expenses and Commissions in all cases.

The Massachusetts Cotton Goods industry has been regarded as an exceptionally successful one, and, as a consequence, has attracted to itself more Massachusetts capital than any other single pursuit. Yet in this Report we find that its "Excess of Selling Price above Cost of Production" was among the very lowest, being only 4.26 per cent, and that the Net Loss was 10.91 per cent of the Selling Price,—or in other words, goods costing one dollar to make were sold for eighty-nine cents. Now, the Cotton Goods industry like others has its ups and downs, but I do not believe it ever had as bad a year as this. But if the figures are correct, then it follows that the choice of that year for the gathering of the original data was an unfortunate one. What we want to understand is the normal condition of Massachusetts industry, and it is the duty of the statistician to advise his readers of any abnormal facts among the data on which his calculations are based. The condition of this industry during the year in question was certainly just such an abnormal fact. More than that, its peculiar situation was so important a fact as to suffice by itself to vitiate final conclusion of the Report by 64.61 per cent.

Of course, in any given year some industries will show more and others will show less than their usual profits. But, to fit such a year to serve as the basis of a statistical inquiry of this nature, these antagonistic conditions should nearly balance each other. And when, as in this case, it is obtrusively evident that they do not, very careful attention and mention should be given to the circumstance. There are, as tables in the Report show, several instances of abnormally large profits, but the industries in which they were obtained were all very small, so that even in the aggregate they count for very little. Such as their influence is, it is more than counterbalanced by that of other industries in which the reported "Excess of Selling Price above Cost of Production" was below what its average for a course of years must have been. A study of the subsidiary tables will, I think, make this evident to anyone. But even if this were not true, the abnormal condition of the great Cotton Goods industry greatly overbalances in its effect upon final results all the antagonistic effects of the indus-

tries favored that year by more than average profits. I cannot but think that Mr. Wadlin was bound to apprise his readers of the effects traceable to the abnormal condition of this great industry. As he has not done this, it may assist our comprehension of the matter to supply the deficiency.

The Cotton Goods industry employed 27.33 per cent of the whole capital, and produced 11.55 per cent of the whole output of the 10,013 establishments reported. Two facts are to be noticed,—the great relative importance of the industry, and its unusual preponderance of capital to output. Such an industry must have a very large “Excess of Selling Price over Cost of Production” to yield the ordinary rate of “Net Profit” on capital. According to the returns, this Excess was only 4.26 per cent of the Selling Price, and this netted a loss (according to Mr. Wadlin’s way of figuring profit and loss) of 5.77 per cent on capital. On an average of years this industry would certainly yield just about such a percentage of profit. But to give a profit of 5.77 per cent on capital would require 26.08 per cent of the Selling Price. The difference 21.82 per cent on 11.55 of the product amounts to 2.52 per cent of the total product. If, then, the Cotton Industry had been in its normal condition during the year for which the statistics were gathered, the percentage of Selling Price that went to profits would have been 6.42 per cent, according to his own way of figuring Net Profits, instead of 3.90 per cent, as Mr. Wadlin now has it.

It will be noticed that all the suspicions which naturally arise as to the accuracy of the original data, or as to their being representative of normal conditions, make in one direction. So far as they should be justified, by a re-examination of the facts, the correction of the data would in every case go to swell “Net Profits” and the “Excess of Selling Price above Cost of Production.” If they should all prove well founded, even if the correction in each instance was quite small, “Net Profits” would assume proportions considerably greater than common observation would allow us to believe. It does not at all follow from this, however, that these suspicions are not well founded. The proper explanation would probably be that items of cost had been omitted from the returns of some manufacturers. This probably has occurred, and to an extent sufficient to materially affect final results. But to gauge the amount of error flowing from this source is utterly beyond the power even of those who gathered the original data.

The more thought I give to this subject the better am I convinced that we can never arrive at the statistical solution of this problem of the division of product between capital and labor by the method of exclusion applied to limited departments of human effort. A fair degree of accuracy can be attained by that method when the remainder sought is a large proportion of the whole. But when the remainder is expected to be small, the method is not to be depended upon, for the reason that all errors are focussed and magnified in the remainder. Thus, in the "Table for all Industries" an error of 1 per cent in "Stock Used" involves an error of over 15 per cent in "Net Profit," the final remainder. Results, inherently subject to such uncertainties, can never command much confidence. The trouble is not with the deductive processes. It requires indeed a broad and firm grasp of economic principles, and a familiar acquaintance with business life to avoid the numerous theoretic pitfalls that beset the path of investigation, but these difficulties are by no means beyond our powers. What we can never be sure enough of is our original data. The gathering of these requires almost, or quite, as much theoretical and practical knowledge as it does to utilize them when gathered. But it is, of course, almost impossible to command such abilities for such work.

Then, again, while it is both useful and interesting to know how the net product of manufacturing is divided between wages and other forms of income, we have only crossed the threshold of our real problem when that is determined, and some allusion to this should have been made in the Report to prevent misuse of its results. The statistical information that we are most anxious to get is how the income of the laboring class, as a whole, compares with the income of the moneyed class as a whole. To obtain a knowledge of the division of the net product of manufacturing tells us little or nothing as to how the gross annual product of the whole country is divided. The proportions for manufacturing are not those for agriculture, or for retailing, or for wholesaling, or for commission and jobbing business, or for the extractive industries, or for transportation, or for brokers, or for banking and insuring, or for the rendering of personal services, or for the services of wealth, such as shelter. Before the great problem is settled not only has the proportion the return to capital bears to the return to labor to be determined for every kind of industrial effort, but they have to be amalgamated in proportion to the net product of each. The moment we attempt to demarcate classes of business we are confronted

with serious difficulties. We met one of them in this analysis in drawing a line between the manufacturer and his commission house. Then we have to ascertain what part of the net product is absorbed by the merely speculative holders of commodities. The more we consider the problem the more it grows. I do not say that such inquiries as those of Mr. Wadlin are useless. Far from it, they have great value in acquainting us with the conditions of the different kinds of industrial life, and they are useful also as tending to confirm, or qualify, the results obtained in, what I cannot but think, a better and more satisfactory way of attacking the greater problem. The sum annually expended in wages throughout the whole country can be, and is, statistically ascertained, with a close approximation to accuracy. If, then, we could obtain the value, as paid by the final consumers, of all the commodities produced, and all the services rendered in America within the year, we would have the total income of all classes. The difference between this sum and the total of wages is retained by the moneyed classes, and constitutes their income. All of the confusing elements of the problem disappear, and all the sources of error are dried up once these two great sums are known with a fair degree of accuracy. The remainder is a large one, and the mistakes and errors that have escaped detection are not focussed and magnified in it to anything like the same degree that necessarily occurs in Mr. Wadlin's tables. I understand that great pains have been taken in the last census to ascertain the gross value of the material commodities annually produced. If so, we will soon have a firmer basis to go upon, for the data exist from which we can calculate, with a fair degree of reliance, the other elements of the problem, namely, the sum total of wages, and the gross value of services, both those rendered by persons, and those, such as shelter, rendered by invested wealth.

APPENDIX A.

The returns for Print Works, Dye Work, and Bleacheries makes the "Stock Used" 104.35 per cent of the "Selling Price," and the "Excess of Cost of Production over Selling Price" 28.54 per cent. Or, in other words, these processes of manufacture, instead of adding something to the value of the material operated on, detracted from it to an extent which involved a depairment of 36.25 per cent of the capital engaged.

In a note on page 365, and elsewhere, it is explained that the work done in these establishments was largely custom work, and that, when such was the case, the value of the material (belonging to others) operated on was included in "Stock Used," but not included in "Selling Price," which was credited only with the charge for work done. The returns for these industries are, therefore, fallacious and unfit for statistical purposes. The duty of a statistician in such cases as this is very plain. He must either procure amended reports, or, failing in that, he must reject them altogether. He is by no means justified in placing returns, known to be very erroneous, on a parity with those supposed to be fairly accurate, merely because he has called attention, in a foot note, to their defects. But the initial error of the employment of such statistical data makes it an imperative duty to acquaint the reader with the effect upon final results, which the elimination, or the probable correction, of such data would have. In a note at the end of the report, an attempt is made, it is to be feared not very successfully, to "rehabilitate" this industry, but there is a failure even to hint at any effect upon the final results due to this correction being accepted as probable. Nor can it be pleaded, in extenuation of this offence against statistical method, that the error resulting is an insignificant one, and therefore properly neglected. On the contrary, the rejection of Print Works returns, as confessedly too erroneous to be of any value whatever, increases by 1.26 per cent of the "Selling Price" both what Mr. Wadlin calls the "Excess of Selling Price over Cost of Production" and "Net Profits." The latter, which is the final result, and the one on which about all of the deductive work is founded, is increased by almost one-third by the elimination of print-work returns, or by over 50 per cent if the attempts to correct the returns be accepted. The probability appears to be that the incongruity of the print-work returns was not noticed, nor the character of them known, until after the completion of the tables, and that, in the hurry of going to press, the explanatory foot notes were too hastily assumed to be all the occasion called for. But this excuse, if it be the correct one, is hardly acceptable for an error of such magnitude.

APPENDIX B.

Evidently, in determining the ratio in which "Added Value" is divided between capital and labor, we are concerned with all the capital employed, irrespective of its form or ownership. The Massachusetts Report seems to have overlooked entirely that part of manufacturing capital invested in patent rights and other special privileges. The capital invested in rented lands and buildings was very likely omitted because rent paid had been included among the items constituting Cost of Production. In doing this, however, a theoretical error has been committed. Manufacturers rent land and buildings, just as they borrow money, in the expectation of obtaining a profit, out of their use, in excess of the rent or interest they

contract to pay. So far as this inquiry is concerned, rented land and buildings stand on an exact parity with what Mr. Wadlin calls "Credit Capital." Both should be included, or both excluded, as items of "Classified Capital."

I have thought it best to put estimated values upon these two items of capital so as to make my tables correct in form. I have, however, no data at hand on which to base my estimates, especially the latter one. But while the two amounts are merely guessed at, they are not, perhaps, wholly improbable. Moreover, what of error is involved is of no great moment to this discussion, as the total of capital is only of use to us in determining what percentage of itself is annually earned by it. The knowledge of this is useful to us as a means of gauging the inherent probability or improbability of our final results, but it has no effect whatever in the determination of the immediate problem in hand, which is how labor and capital divide their joint product.

APPENDIX C.

As the reader will doubtless notice for himself, I have everywhere in this criticism accepted both the accuracy of the original data and the correctness of the estimates in the Report, contenting myself with endeavoring to show that the final results, deducible from these data and estimates, are not those given us. In pursuance of this policy I have left the item of depreciation unchanged. The estimate of 10 per cent per annum as the average depreciation of "Machinery, Implements, and Tools" is probably fair enough. But if the full depreciation is chargeable as a loss, whatever is expended in keeping up or improving the character of the plant is to be entered as a profit, which, so far as it goes, counteracts or balances the depreciation. If I understand correctly what is said of "New Equipment," on page 494, this expenditure is all included under this head. If so, it may be pretty positively asserted that a good many items which should have been charged to "New Equipment" have been carried to the account of "Repairs," or of "Stock Used," or even to wages. To the extent in which this suspicion proves to be correct, the rectification of the item of "New Equipment" would go wholly to the increase of the share of capital in the net product. There are, indeed, indications that a very serious error lies lurking in those parts of the original data. Thus, Mr. Arthur T. Lyman, in commenting upon this same report,* gives us some figures of his own gathering. He cites the returns of a number of large mills (chiefly cotton mills), which, during the last ten years, have paid \$7,229,300 in dividends, and \$44,809,962 in wages. But he goes on to state that the actual value of the property held by these corporations is \$21,208,974, although the stock capital, originally contributed, and on which dividends are paid, is only \$12,000,000. In other words, these corporations, in addition to the dividends they have paid over to their stock-

* *Christian Register*, Nov., 1891.

holders, have realized profits to the extent of \$9,208,974, which they have retained and reinvested in their plant, which reinvestments should appear as "New Equipment" in the tables of the Report. It is probable that a considerable portion of these reinvested profits were secured previous to the ten years Mr. Lyman's figures cover. But if three-fifths of these gains accrued during the ten years in question the "New Equipment" account of these mills would be large enough to cover the 10 per cent for depreciation and about 2 per cent on capital annually. Or, to speak roughly, the means of accurate computation not existing, the "New Equipment" account of these establishments, instead of 0.24 per cent, would be about 3.80 per cent of the "Selling Price." As a rule, small establishments do not keep up or increase their plant as carefully as large corporations; but, all allowances being made, Mr. Wadlin's general average of 0.24 per cent for New Equipment looks suspiciously small by the side of Mr. Lyman's figures. The existence of a very considerable error here is morally certain, but in the absence of any authentic data it would, of course, be folly to attempt an estimate. All that can be done is to point out the direction of the effect that would result from its rectification, which would, of course, be an increase in the annual return to capital.

APPENDIX D.

It is true, as the Report assumes, that 2½ per cent of the selling price is the usual commission charged for selling goods. In properly gathered statistics no occasion would arise for estimating this item. The Selling Price should have been returned exclusive of all commissions and expenses of selling. This is the form adopted by the U. S. Census Bureau, and it is the only form tolerable to correct statistical method. It may also be added that it is the form in which manufacturers who sold through commission houses would naturally employ, both in keeping their books and in making returns. It may therefore be safely assumed that, in a good many instances, no matter how inquiries were worded, net instead of gross receipts have been reported as the selling price. To the extent in which this has occurred it is evident no further deduction should be made.

But it is well understood that a very considerable element of profit lurks in the commissions charged for selling goods, and it is this source of gain which a great many manufacturers seek to secure for themselves by selling their own goods. If the expense of doing this was not considerably under 2½ per cent, these manufacturers (probably a majority of the whole) would send their goods to the commission houses. The fact that they do not do so makes it certain that this 2½ per cent of their output is too large an estimate. The percentage I have assumed, namely, 1.75 per cent, is to be sure only a guess, but it is certainly as large a deduction as is justified by Mr. Wadlin's own estimate.

APPENDIX E.

The Report falls into the error of assuming that all individual manufacturer's loss from bad debts is a loss to employers and moneyed men as a class. It is, indeed, true that $2\frac{1}{2}$ per cent is the ordinary charge of commission houses for guaranteeing accounts. But it is also well known that this charge, like their commission for selling, yields them a very considerable profit, which profit many manufacturers secure for themselves by selling their own goods, or by not requiring a guarantee from their commission houses. These circumstances, however, though they are considerable enough in themselves, are not what I am principally referring to here. Granting for the moment that the average of loss by bad debts is fully $2\frac{1}{2}$ per cent of the selling price, it by no means follows that business men, *as a class*, lose anything like that amount from this cause. When goods sold are not paid for there is no absolute destruction of value, but only a transfer. The buyer gains what the seller loses. When they both belong to the employing and moneyed class, that class, *as a class*, neither loses nor gains anything. The case is different, however, when the buyer belongs to the wage-receiving and the seller to the wage-paying class, or vice versa. What wage receivers consume without paying for is virtually an addition to the aggregate income of the laboring class, obtained at the expense of the moneyed class. On the other hand, the employers, *as a class*, gain, and the laborers, *as a class*, lose when an insolvent firm fails to pay wages earned and due. If we suppose, as we easily may, a state of society in which laborers paid cash for all they bought, individual merchants and manufacturers might continue to lose by bad debts as heavily as before, and might continue to add $2\frac{1}{2}$ per cent to their selling prices to cover this risk. But, *as a class*, they would suffer no loss at all, the insolvent dealers gaining every cent lost by the solvent ones.

It is evident enough, therefore, that in such an analysis of product as Mr. Wadlin has undertaken, in which industrial classes, and not individuals are to be considered, only such proportion of the losses incurred through giving credit, as can ultimately be traced to failure to pay on the part of wage-receivers, is to be allowed for. Assuming with the Report that $2\frac{1}{2}$ per cent of the selling price covers the risk of selling to both classes of final consumers, and assuming further, what must be very nearly the truth, that two-thirds of all goods produced, and of all services rendered, are consumed by wage-receivers, and the other third by their employers, and neglecting what laborers lose by non-payment of wages, we would have $\frac{2}{3}$ of $2\frac{1}{2}$ per cent of the total product of the community as the real loss suffered by the moneyed classes from this cause. This loss would be distributed among various businesses in proportion to their total sales, but its aggregate would be exactly equivalent to $\frac{2}{3}$ of $2\frac{1}{2}$ per cent of the values created in these businesses. As the percentage of added value to total sales differs in different industries, we cannot affirm

that in any one of them the loss from bad debts is exactly $\frac{1}{3}$ of $2\frac{1}{2}$ per cent of the added value, but we can affirm it of all industries taken together. Whether it would be slightly less or slightly in excess of this ratio for manufacturing we have no means at hand for determining. I have, therefore, employed this average ratio, and find that it amounts to 0.62 per cent of the selling price, instead of 2.50 per cent, as in the tables of the Report. This, of itself, constitutes a very serious modification of his final results, but there can be, I think, no question raised as to the validity of this part of my analysis.

I have not attempted the resolution of this 0.62 per cent into wages and other forms of income, although it seems probable to me that doing so would not vary appreciably my final results. Taking into the account the offset to it, afforded by non payment of wages, and the fact that guaranteeing accounts at $2\frac{1}{2}$ per cent is on the whole a very profitable business, it is altogether likely that capital obtains more than one-third of this item, that is to say, more rather than less than its proportion of the rest of added value.

APPENDIX F.

This element of unsalaried labor performed by partners in private firms both as managers and as manual laborers could readily have been differentiated from real profits by proper inquiries in gathering the original data. Indeed, this has been accomplished in the tables of the United States Census. The difference in character between the two forms of income is altogether too radical to allow of their consolidation in scientific work. To supply this deficiency in tables of the Massachusetts Report, I am forced here, as elsewhere, to make an estimate I would dislike to venture upon as an original investigation. I have figured out the value of these unsalaried efforts on the basis of each partner in private firms performing \$600 worth of labor per annum. This is, to be sure, only what a third or fourth rate clerk can command, but, on the other hand, a few individuals are members of two or more firms, and a few others do not take any part, or a very small part, in the conduct of their business. I am confident, however, that most of my readers will consider the estimate too small rather than too large.

The Report does not give us the number of partners in the 13,887 "Not answering" establishments. I have been obliged, therefore, to assume the same proportions as in the returns of the answering establishments, and that few or none of the unreported establishments were incorporated.

APPENDIX G.

With the exception of the wholly inexcusable inclusion of the Print Work returns, the Report has erred most seriously in persistently asserting that there is every reason to believe that the same proportions exist in the business of the 13,887 establishments which failed to report, as in

the 9,948 which answered the inquiries made of them. Unfortunately, statistical data are rarely complete, and often the only possible way to supply their deficiencies is to assume the complete similarity to known facts of partially unknown facts, which, so far as they are understood, resemble the known facts. Mr. Wadlin's mistake lies in neglecting to assure himself that this basis of known resemblances existed. If he had looked for them he would have found, instead of resemblances, well marked differences, the probable effects of which should have been carefully thought out. He tells us that the 13,418 establishments which failed to report, while 57.27 per cent of the whole in number, possessed but 24.55 per cent of the total capital, and turned out but 30.79 per cent of the total product. The serious discrepancies in these percentages are very indicative, and they should have at once arrested his attention.

In the first place it is evident that final results might be considerably affected if it were found on examination that the more profitable industries were more or less fully reported than the less profitable ones. Assuming that in each industry the percentage of "Excess of Selling Price over Cost of Production" was the same in both reported and unreported establishments, I have carefully figured out this excess for "Not answering" establishments, exclusive of Print Works, and I find it to be \$32,644,698, which is 15.94 per cent of the \$204,772,141 product of these establishments. The 9,948 establishments (Print Works excluded) give an average, according to the Report, of only 14.21 per cent. This difference of 1.73 per cent on the 31.08 per cent of total Selling Price received by the "Not answering" establishments makes an addition of 0.54 per cent to the general average of the "Excess of Selling Price above Cost of Production." This difference seems small when expressed in percentages, but it is by no means an inconsiderable sum, amounting as it does to \$3,567,268, or about \$100 annually to each partner and stockholder in manufacturing enterprises. The sum is indeed large enough, if it were so applied, to come within a small fraction of paying all taxes levied upon manufacturers, a burden that to them, at least, does not appear inconsiderable.

We have had but little difficulty in ascertaining that, even if the rate of profit is, as the Report assumes, no greater in the unreported than in the reporting establishments, a by no means inconsiderable modification of his final result is necessitated when all establishments are brought into the computation. But are there any indications of difference in the rates of profit enjoyed by the two classes of establishments? Surely, the discrepancies in percentages, to which I have already called the reader's attention, are calculated to excite suspicion of Mr. Wadlin's somewhat hasty assumption of the equality of their returns.

Of the few large establishments which failed to report it may safely be affirmed that some feared to invite competition by divulging the extent of their gains, and others, that their credit would suffer from an acknowl-

edgment of their losses. How far these antagonistic influences balanced each other there are no means of determining. Nor is it very important that it should be known, as the great mass of these establishments were small ones, not interrogated on account of their insignificance, or that failed to reply because their owners considered their own influence on the general result to be inappreciable, or because they were not especially interested in statistical inquiries. Now, what points of difference are there in the character of small as compared with large establishments, on which *a priori* deductions as to their respective rates of profit can be based?

1. There unquestionably exists in the popular mind a misty sort of idea that the rate of profit is greatest in the larger establishments. But is this so? Is it not more likely that the law of diminishing returns applies here as well as elsewhere throughout all industry? Ask any man who has established a successful business whether his greatest rate of legitimate return was not enjoyed in its early years, before the capital employed had expanded to its present proportions. No one, who doubles the capital he employs in any special business enterprise, expects to fully double the return, unless there are peculiar circumstances in the case which put a capital below a certain size at special disadvantage. Even here, after that size is attained, further "doses of capital" do not produce quite their proportion of effect in profits. Any business man will tell you that it is comparatively common, and easy, to procure returns of 20, 30, 40, or even 50 per cent from small investments, but that such returns are never realized from large enterprises, unless they are monopolies. The real state of affairs is somewhat disguised by the fact that what is asserted above is only true of legitimate business ventures, such as we have to do with in our analysis. The truth is exactly the other way in speculative matters. In that troublous sea the small fish are the natural subsistence of the larger. And it will be found, I think, in almost every case, when a man's rate of profit increases with the growth of his capital, or even holds its own with it, that it is because his gains are largely speculative.

2. We find these smaller establishments turning out almost invariably a large product in proportion to their capital. This is because they are not so well able to anticipate their wants in raw material, or to hold their completed product for higher prices. My personal impression, founded upon opportunities for observation somewhat better than common, is very decided that, in the long run, and on the average, manufacturers lose rather than gain by anticipating their wants and by refusing to meet the market. If my impression is a correct one, this would point to a decided advantage possessed by small establishments. But even if nothing is lost by large manufacturers in this manner, the capital employed by them in holding large quantities of raw material and finished goods cannot earn nearly so large a rate of return as the balance of the capital

employed in their business, so that, other things being equal, the average rate of return to large capitals would be lessened by this cause. On the other hand, it is evident that a business with a large output in proportion to the capital engaged needs a smaller percentage of "Excess of Selling Price above Cost of Production" to yield the same percentage of return on capital. The presumption is therefore against the unreported industries showing more of such excess than the reported ones, so far as this last-mentioned influence extends.

3. There can be but very few corporations among the 13,387 unreported establishments, and the partners in small private firms enjoy too limited incomes for many of them to be personally idle. Unsalaries efforts must then count for vastly more than in the 9,948 reporting establishments. This, of course, would go to increase Excess of Selling Price and Net Profits as figured by Mr. Wadlin.

On the whole, we are entitled, I think, to expect from *a priori* reasons that the unreported establishments should show a considerably larger "Excess of Selling Price above Cost of Production" than those which have been tabulated in the Report. But have we no resource in the data laid before us for determining statistically what the difference probably is? It would seem as if we could put some reliance in the results of a comparison of those reported industries among the sixty then under analysis, in which the average capital of each establishment was small with that of all the industries taken together, because the business of these industries of small capital, taken as a whole, is very similar to the business of the unreported establishments, taken as a whole, in the very points in which we have found the latter to differ from the reported establishments, taken as a whole. We will not, of course, be able to get any very definite idea as to the exact figures for these 13,387 unreported establishments, but we should arrive at very certain knowledge as to the direction in which they vary from the figures of the 9,948 establishments, and some inkling as to the amount of the variance. Although the criticisms advanced against the final table of the Report apply with equal force to the subsidiary tables, of which the final one is a condensation, their rectification would involve more time and labor than I am able to command, even were such rectification essential to my present purpose. The items that constitute Cost of Production in the tables, although as we have seen they are not exactly the items which really enter into cost, are yet, when taken separately, all correctly obtained from his original data. From this it follows that his "Excess of Selling Price above Cost of Production" is also a positively determined sum. It is perfectly legitimate and safe, therefore, to first ascertain how this excess in the small establishments compares with the same excess in the large, as exactly the same differences will necessarily appear both in his "Net Profits," and in mine.

Probably the "natural man" will be inclined to cast aside as worthless

TABULATION OF INDUSTRIES AVERAGING \$20,000 CAPITAL OR LESS PER ESTABLISHMENT.

Name of Industry.	Number of Establishments.	Average Capital.	Total Capital.	Total Product.	Percentage of Excess of Selling Price to Total Product.	Sum Total of Excess of Selling Price.	Percentage of Net Profit to Capital.	Total Sum of Net Profits.
Artificial teeth and dental work.....	120	\$633	\$75,968	\$172,587	51.67	\$80,128	97.90	\$74,392
Boxes, paper and wooden.....	117	15,577	2,879,347	2,879,347	15.93	438,480	12.85	234,005
Brooms, brushes, and mops.....	35	13,316	466,043	1,054,011	16.61	170,071	22.18	103,868
Buildings (including concrete walks, etc.).....	1,227	3,928	4,818,926	16,393,245	18.31	3,085,124	40.54	1,953,592
Burial cases, caskets, coffins, etc.....	31	8,807	273,015	472,086	13.91	65,767	11.78	32,261
Carriages and wagons.....	496	6,910	3,427,282	5,027,457	21.07	1,062,285	19.67	674,146
Charcoal and kindlers (including fire works and matches)	4	4,832	19,360	68,912	60.00	32,840	190.38	32,840
Clothing.....	826	7,081	6,592,183	16,467,247	21.21	3,296,966	33.05	2,178,716
Drugs and medicine (including perfumes, etc.).....	156	4,551	709,929	1,631,564	39.71	647,804	74.65	529,962
Earthen, plaster, and stone ware.....	24	16,965	407,166	493,258	29.44	145,215	25.89	105,416
Electroplating (including jewelry burnishing, etc.).....	31	3,116	99,505	224,457	33.28	74,699	66.79	56,560
Fancy articles (including fine arts, etc.).....	16	2,766	44,260	77,263	41.08	31,740	57.18	25,308
Food preparations (including salt).....	684	19,194	13,128,503	47,044,946	11.72	5,967,590	20.40	2,678,215
Hair work, animal and human.....	22	7,969	175,091	352,554	7.40	26,069	1.00	1,751
Ink, mullage, and paste.....	12	5,936	71,225	109,798	30.88	33,906	34.92	24,872
Liquors and beverages (not spirituous).....	25	7,296	182,367	245,846	32.48	79,851	31.39	67,251
Needles and patterns.....	37	1,872	70,005	175,881	37.53	66,716	75.48	52,949
Photographs and photographic material.....	115	3,155	362,869	560,894	34.63	104,238	38.84	144,517
Printing, publishing, and book binding.....	389	15,247	6,083,542	10,504,447	32.20	3,382,432	34.02	2,378,594
Scientific instruments, etc.....	32	18,870	603,814	827,098	18.00	146,969	12.29	74,209
Ship-building (including awnings, etc.).....	125	2,914	354,380	897,931	25.92	232,744	47.00	171,259
Sporting and athletic goods.....	13	8,183	106,380	176,680	22.94	40,530	24.79	27,372
Stone.....	193	14,068	2,713,104	4,076,233	20.80	861,525	20.11	646,605
Tallow candles, soap, and grease.....	73	14,278	1,042,262	2,273,506	14.88	338,298	17.64	183,865
Trunks and valises.....	12	5,347	64,160	161,065	20.96	33,757	34.93	22,451
Wooden goods.....	290	8,701	2,282,253	3,160,771	20.38	643,165	16.71	378,024
Totals for 26 industries, with smallest capital per establishment.....	5,085	9,220	46,885,941	114,929,593	18.81	20,793,504	26.74	12,587,774
Remaining 37 industries (print works excluded).....	4,863	65,199	317,060,987	339,061,692	12.90	43,727,237	3.43	10,897,660
Totals for 63 industries (print works excluded).....	9,948	32,566	383,964,928	453,981,285	14.21	64,510,741	6.44	23,425,434
Totals for 24 industries with smallest capital per establishment.....	4,369	7,588	33,153,624	66,597,039	22.60	15,066,955	29.52	9,785,350
Totals of 39 industries (print works excluded).....	5,579	59,102	330,793,304	387,384,246	12.76	49,443,886	4.16	13,640,084
Totals of establishments not answering.....	13,367	8,698	120,466,039	204,772,141	.....	.....	.....	.....

the original data which yield such results as the above. In this, however, he would act somewhat hastily, as the anomalies which appear are very largely due to Mr. Wadlin's methods of calculating "Net Profits," though it must be confessed that some grounds for legitimate suspicion of the correctness of his data would remain even after his calculations of "Net Profit" were corrected. The separation of the business of the smaller from that of the larger establishments given in the above table proves, however, beyond question, that Mr. Wadlin's methods of handling the data must be very defective, and the estimates of unknown quantities very erroneous, if a fair degree of accuracy be allowed to his original data.

No matter what the figures prove, it is, of course, the height of folly to imagine that the rate of profit in business conducted in small is about seven times the rate obtained in business conducted in large establishments. If, however, we discard from the table above the two last columns, its other figures are not so intrinsically impossible. To illustrate, if we were comparing a number of percentages varying between 51 per cent and 75 per cent, the variance would not be greater, perhaps, than the circumstances of the particular case would lead us to expect. But if, led thereto by arbitrary estimates and erroneous calculations, we should deduct 50 from all our percentages, they would then range from 1 per cent to 25 per cent, and we would be at once warned of error by an irregularity in our results, far beyond what could really occur in the phenomena. It is owing to a process, similar to this, that Mr. Wadlin's errors become focussed, as it were, in "Net Profits," and consequently these last two columns can be discarded as palpably erroneous, without much impairment of the credit to be given to the results in the preceding columns. It is not at all impossible, or even improbable, that what is called "Excess of Selling Price above Cost of Production," with a general average of 14.21 per cent for all industries, should have an average of 18.81 per cent to 22.60 per cent in industries conducted in small establishments, and an average of 12.76 to 12.90 per cent in those conducted in large establishments. As Mr. Wadlin does not indulge himself in any estimates in arriving at this percentage of 14.21 (for 63 industries), it is absolutely in accordance with the original data, as is the percentage of 22.60 for the 24 smaller, and the percentage of 18.81 for the 26 smallest industries. If these percentages are wrong the defect is in the original data, which we have assumed to be correct for the purposes of this criticism.

My object in drawing up this table was to obtain a comparison between the business of the 13,387 establishments not answering and the business of such of the answering establishments as most nearly resembled them in size and character. Unfortunately, an industry is found just within the line arbitrarily chosen, so extensive, and so peculiar, as to render the results obtained almost useless for this special comparison. I refer, of

course, to "Food Preparations" in which the average capital is within \$807 of being large enough to exclude it. The anomalous feature of this industry, which vitiates the tables in which it is included, is the output which, instead of being 25 per cent in excess of the capital (the general average for all reported industries), is so enormous that it is actually 262 per cent in excess of capital. I have already pointed out that the larger the output the smaller is the percentage of it required to yield a satisfactory profit to the capital engaged. As the effects of this law, while this industry is almost as profitable as the other twenty-five, the percentage of "Excess of Selling Price over Cost of Production" is very small. And as "Food Preparations" is by far the largest of the 26 industries considered, so large, indeed, that its output is more than 41 per cent of the whole, the results obtained from the 26 industries are not at all comparable with the facts known about the business of the 13,387 establishments not answering. If, however, instead of selecting \$20,000 capital as our limit, we take \$17,998 (twice the average capital of the 13,387 establishments), taking, that is, the 24 smallest capitalizations instead of 26 (omitting this industry of "Food Preparations," together with the unimportant industry of "Scientific Instruments"), we obtain results bearing a fairly close resemblance to the facts known about the business of the 13,387 establishments. In these 24 industries the capitalization averages \$7,588 against \$8,998. This would lead us to anticipate a somewhat greater "Excess of Selling Price above Cost of Production." But, on the other hand, the output as compared with capital is proportionately greater, being about 100 per cent in the one case, and about 70 per cent in the other, and this circumstance would naturally lead to a somewhat lower "Excess of Selling Price." In the absence of positive data, these antagonistic tendencies seem to fairly balance each other, I have therefore assumed this to be the case and have constructed my tables accordingly.

I am perfectly aware that I have obtained this percentage by the very doubtful expediency of analogy, always a dangerous reliance, and always an objectionable one when more positive information is obtainable. But it must be borne in mind that I do not oppose this analogy to any positively known facts. There are none such to be found in the original data, or elsewhere, that I know of. What it does seek to supplant is a mere assumption on the part of the Report for the validity of which he does not claim to possess any proof at all. An analogy is at least a good deal better than a mere guess. And especially is this so when the analogy is as strong as it is in this case, and when its results are in agreement with what we had a right to expect from *a priori* considerations.

Assuming, then, as highly probable, and in lack of any better information, that the average of "Excess of Selling Price," etc., was 22.60 per cent in the 13,387 establishments not answering, against an average of 14.21 per cent in the 9,948 establishments that reported in full, we would

have an average of 16.82 per cent for the whole 23,385 establishments whose business we are attempting to analyze.

How this difference of 2.61 per cent of Selling Price is to be divided among the items of what is considered in the Massachusetts Report as Cost of Production is a matter which we have no means of determining accurately. How it is distributed makes no difference at all in the percentage of Selling Price, obtained by employers and capitalists, but it does affect the percentage obtained by labor, and, through this, it affects the proportions in which the added value is divided between labor and capital. An examination of my tables will show that 1.02 per cent of the selling price (constituting nearly two-fifths of this item) is accounted for by the labor of principals, so that after all only 1.59 per cent of this 2.61 per cent is really problematical. This 1.02 per cent is, of course, a saving in wages to the members of private firms. It is also fair to suppose that of the remaining 1.59 per cent, as well as of the 0.54 per cent of Selling Price noticed in the first part of this Appendix, some, though a minor part, was due to a saving of wages, and that the balance was due to the lessening of other items of cost. Adding the two items together we have 3.15 per cent, to allow for which, I have, in accordance with the above considerations, deducted half from wages and half from other items of employer's cost. And I believe that under the circumstances the division is as nearly correct as our means of computing it will allow.

CLASSIFICATION OF TRADE STATISTICS.

The classification of statistics largely determines their usefulness to the general student. The results must be accepted as they come from the statistician, for the task of reclassifying is practically beyond the power of all who have not at command a well equipped statistical force.

It cannot be expected that any one plan will meet every requirement. But there are certain general principles to which all schemes of classification should conform. Homogeneity, uniformity, simplicity, and adequacy may fairly be said to be universal requirements.

The classification of Domestic Exports and of Imports, adopted by the Bureau of Statistics of the Treasury Department, is as follows :

Exports of Domestic Merchandise.

Products of Agriculture.

Products of Mining, including crude mineral oils.

Products of the Forest.

Products of the Fisheries.

Products other than of Agriculture, etc.

Products of Domestic Manufacture.

Imports of Merchandise.

Articles of food, and animals.

Articles in a crude condition which enter into the various processes of domestic industry.

Articles wholly or partially manufactured for use as materials in the manufactures and the mechanic arts.

Articles manufactured, ready for consumption.

Articles of voluntary use, luxuries, etc.

Viewed in the light of the principles above mentioned, this classification is deficient in several respects.

Homogeneity requires that the same basis of classification shall be observed throughout. This is the first and most fundamental requirement. The plan adopted should be sufficiently inclusive and exclusive ; no item would then be capable of classification under more than one division in a given investigation. Conformity to this principle is often difficult, yet it should be sought not the less, for the extent to which it is realized determines the integrity of the work.

The basis adopted for exports is in part "kind of commodity,"

and in part "stage of production." On the basis of "kind of commodity," there appear products of agriculture, products of mining, etc., while on the basis of "stage of production" certain products are given as manufactured articles. The demands of homogeneity are evidently not met here, for the same article may be a product of agriculture, or of mining, etc., and at the same time be manufactured.

It is manifestly the intention of the Treasury Department* that, in a comparison of exports of manufactures with those of raw materials, the articles classed as products of domestic manufacture should be compared with the total of all the other groups. Accepting this view, the classification is still open to criticism. There does not appear to be a uniform principle for deciding between the manufactured and other articles. Flour and all grist mill products, canned fruits, cottonseed and linseed oils, glucose, glue, all provisions, and wine are placed as products of agriculture; saw-mill products are products of the forest; canned and cured fish are products of the fisheries; all of which it appears are to be considered as manufactured in comparisons involving manufactured and crude materials. In the list of manufactures will be found bricks, lime and cement, fertilizers, pig-iron, ground coffee and cocoa, sole leather, malt liquors, ground spices, refined mineral oil, and other similar products. It must be granted that it is extremely difficult to make a scientific distinction between raw materials and manufactured products; but it is not clear by what criterion grist mill products, canned goods, cottonseed and linseed oils, and wine belong to the former, while ground spices, ground coffee and cocoa, fertilizers, lime and cement, bricks, refined mineral oil, and malt liquors belong to the latter.

In the classification of imports, the basis is a combination of "wants supplied," and "stage of production." Certain imports are classed as food products, others as luxuries, while others appear as crude, partially manufactured, or manufactured. The inconsistencies here are even greater than in the classification of exports. Among "articles of voluntary use, luxuries, etc.," as distinct from "manufactured articles ready for consumption," are art works, embroideries, laces, manufactures of silk, manufactures of tobacco, and wine. If it be said that these should be placed as manufactured articles in a comparison between total crude and total manufactured, it will not even

* See note p. ciii. *Report on Commerce and Navigation of the United States, 1891.*

then appear why wine should be classed with malt liquors as a manufactured product in imports, while in exports it stands as a product of agriculture. Enough has been said, I think, to make it apparent that the present classification of trade statistics fails to conform to the principle of homogeneity. Surely, an article may be both food product and crude material, or manufactured, both manufactured and food product or luxury.

Uniformity requires the employment of the same plan of classification in similar investigations. This principle is essential to comparison of results, and until such comparison is made any statistical result is meaningless. It is of but little importance to ascertain the population of any district, the death rate in any locality, or the volume and character of trade, unless these facts may be placed along side others of a similar nature to learn whether the given result be large or small, normal or abnormal, and to arrive at conclusions concerning causes and tendencies.

In the case of exports and imports no comparison is possible except of totals. There are exports of agriculture, but no imports of this class. There are imports of food products, but no exports to correspond. The same is true of every class in the scheme used.

The principles of simplicity and of adequacy require, on the one hand, that the classification shall not be carried to an extreme, and, on the other, that it be sufficiently minute. If statistics are to be available for practical uses, the salient facts must not be concealed by a mass of details; and, at the same time, the classes must be sufficiently differentiated to bring out clearly the important facts. "The general rule to follow as regards detailed statistics is to present in detail what the reader or student may reasonably wish to use in detail, or may wish to combine in some way different from the totals or recapitulations given with the detail." *

These principles of simplicity and adequacy are satisfactorily observed in the statistics of trade, with certain minor exceptions that would disappear if the classification were made homogeneous and uniform.

From the classification adopted by the Bureau of Statistics it would seem that the information most desired concerns "kind of product," and "stage of production." Does trade consist more largely of crude

* Charles F. Pidgin, *Practical Statistics*, p. 155.

materials, or of manufactured products? In what proportion do products of agriculture, of the forest, of the fisheries, or of mining enter? Without doing violence to the scheme already in use, it is believed that the following plan will give the information in an improved form.

FOREIGN TRADE.

EXPORTS.

DOMESTIC.

Raw Materials.
Agriculture.
Fishery.
Forest.
Mineral.
Miscellaneous.

Manufactures.
Agriculture.
Fishery.
Forest.
Mineral.
Miscellaneous.

FOREIGN.

Raw Materials.
Agriculture.
Fishery.
Forest.
Mineral.
Miscellaneous.

Manufactures.
Agriculture.
Fishery.
Forest.
Mineral.
Miscellaneous.

IMPORTS.

Raw Materials.
Agriculture.
Fishery.
Forest.
Mineral.
Miscellaneous.

Manufactures.
Agriculture.
Fishery.
Forest.
Mineral.
Miscellaneous.

Missouri State University.

FREDERICK C. HICKS.

PROPOSED STATISTICAL LEGISLATION.

The bill of greatest interest to statisticians which has been introduced in the Fifty-Second Congress is the measure providing for a permanent organization of the Census Bureau (S. 690). The bill was drafted by the Superintendent of the Census, and is the outcome of a resolution passed by the Senate, February 16, 1891, instructing the Secretary of the Interior to report on the advisability of making the Census Bureau permanent. The main features of the bill may be briefly rehearsed. Section 1 reads —

“ That a census of the population, wealth, and industry of the United States shall be taken as of the date of October first, nineteen hundred, and once in every ten years thereafter, as of the said date of October first: and that there shall be a periodic collection of vital and social statistics, and of statistics of agriculture, manufacture, mining, fisheries, churches, education, finance, transportation, and insurance, to be made as hereinafter provided.”

It will be observed that the proposed law changes the census day from June to October. The date is much more satisfactory than the present date. European countries, as a rule, take a midwinter date, but it is believed that the date here chosen would be better than a later date, especially in the northern sections of the country with their rigid winter weather. Moreover, the date avoids the difficulties caused by summer migrations quite as well as if later in the winter.

The section quoted indicates also the scope of the inquiries to be carried on by the Bureau, and has therefore been given in full. The subsequent sections of the bill relate to the details of administration, and may be passed over more rapidly. The proposed Bureau remains in the Interior Department, and is to be organized as soon as practicable. The Superintendent of the Census, at a salary of \$6000, is given the assistance of a chief clerk, a disbursing clerk, and five chiefs of division, “ who must be statistical experts,” at \$2500 annually, besides the necessary clerical force. It may be noted here that the expenditure of the office, for the ordinary years, is estimated at \$200,000, exclusive of printing. Many sections of the bill relate to the manner in which the decennial census shall be taken, and substantially re-enact the provisions of the present law. Among the new features are provisions that enumerators receive a per diem compensation of three dollars for a day of ten hours, instead of the pre-

vailing system of payment according to the number of schedules returned, and, further, the threatening with fines of *all* persons in whatever capacity who refuse to answer the questions contained in the schedules, of whatever description they may be. Under the proposed law enumerators are to be appointed as heretofore by the supervisors of districts. A change, however, is to be noted in the appointment of clerks. At the inauguration of the Bureau the clerks are to be selected by the secretary from the "trained clerks and experts of the Eleventh Census, who shall have served therein satisfactorily for a continuous period of at least two years, and who shall have received from the Superintendent of the Census a certificate to that effect." All other appointments are to be made under the Civil Service rules.

The bill also provides that should any state take a census of inhabitants in the year mid-way between the decennial censuses according to forms and schedules approved by the Superintendent of the Census, the United States shall, upon a requisition from the state in question, pay one-half of the certified cost of such census.

It cannot be our object here to discuss the bill section for section, and it is believed that in the foregoing summary the main points of the proposed measure are set forth. To understand the bill thoroughly we must go back to the report on which it is based.

The crucial point of the bill is the proposed permanence of the Census Bureau. The arguments for such an organization have been repeatedly brought to public notice. Briefly, the advantages of a permanent bureau may be summarized as follows: The saving of time now lost in training clerks and chiefs of divisions; the preservation of essential records; and, finally, a more complete preparation for the work of the enumeration. These arguments find forcible expression in the report of Superintendent Porter. These general considerations are sufficiently familiar to statisticians, but the report gains its vigor from the wealth of specific illustration which it gives. Mr. Porter pursues the ingenious method of reviewing, division by division, the work of his bureau, and showing, step by step, where a permanent organization would benefit the service. It cannot be our purpose to follow him through his arguments, but a few illustrations will suffice. Under the present system the amount of time spent in supervising appointments is unduly large. The temporary character of the work precludes to a large extent the employment of Civil Service clerks, and thus necessitates this machinery.

Consider for a moment the training of chiefs of divisions and clerks. All who are familiar with statistical work know that every statistician learns through his own blunders rather than through those of other people. Now, our present system requires that such blunders must be made and such experience gained once in ten years, unless, indeed, the Superintendent of the Census is always as fortunate as Mr. Porter has been in securing the services of chiefs of division who were employed in a like capacity in previous years. It is needless to say that this cannot always be the case.

Again, consider the item of clerks. Not long ago it was stated in the House of Representatives that the clerks in the division of farms, homes, and mortgages "did not know the difference between a mortgage and a bale of hay." The statement was promptly characterized as an exaggeration, but the mere suggestion points out the difficulties of dealing with an intricate subject with raw clerks. While the greatest difficulty in statistical work is just as apt to come from persons who know too much as from those who know too little, ignorance may be too dense for efficient work. In the work of the division mentioned some general knowledge of the nature of a mortgage is required; in the division of vital statistics some knowledge of the nomenclature of disease; in that of crime some knowledge of the names of crimes; and, in short, in each division, as Mr. Porter clearly shows, there is a certain minimum of information which is the prerequisite of good work. It is not meant that this is more than ordinary clerks can compass, but that this work must be taught a fresh set of clerks once in ten years.

Another gain from a permanent Bureau made prominent in the report is the preservation of records. A vast amount of accessory material, such as lists necessarily unpublished, is collected by the various divisions to facilitate their work. Its preservation and completion from time to time would be a great economy. The reader will find some very striking illustrations to this text in the report of Mr. Porter. He mentions the following lists: Minor civil subdivisions of the country, officers of religious bodies, jails and similar institutions, municipal officers, recording officers, manufacturers, mining operators, transportation companies. One can readily see that it is no little labor to construct these lists, but a comparatively simple one to keep them up to date when once made. At present each list must be made anew once in ten years.

"In 1880 the Census law was not passed until March 3, 1879, and further legislation affecting the work of enumeration of population was had as late as April 20, 1880. In 1890 the census law was not approved until March 1, 1889, and legislation making it necessary to insert additional inquiries on the population schedule was approved as late as February 22, 1890, about three months before the enumeration began. It therefore became necessary to print 20,000,000 schedules and distribute them throughout the country in ninety days."

With these facts Mr. Porter describes one of the greatest defects of the present antiquated system of carrying on the census. Such an important work as the census needs the most careful and well considered preparation. We have at present no guarantee that it will receive that attention, and it is a gross injustice to the Superintendent of the Census to expect a perfect organization of his work in the brief time usually allotted to it.

To his report, of which the above aims to give the essence rather than an abstract, Mr. Porter has added communications from statisticians, commercial bodies, agricultural commissioners, state boards of health, labor bureaus, churchmen, and alienists. It contains, further, the draft of the bill discussed above, a chronological review of census legislation, the census acts of 1790, 1850, and 1879, and the forms of schedules used in each census from the First to the Eleventh.

The communications from the sources above named are practically unanimous in favor of the proposed permanent bureau. The arguments stated are much the same as those discussed, save that in each case the expression of opinion takes some color from the point of view of each writer.

Among the incidental advantages of permanency in the Census Bureau, some of the writers dwell very properly on the collection of a statistical library. This is something which statistical students would greatly appreciate, and which at present is lacking at Washington. If no where else, centralization of statistical work is very desirable in a library.

In general these communications subordinate the question of organization to that of function. The commercial bodies approve the plan and desire more complete and more frequent information on questions of commerce, manufacture, transportation. The agricultural organs believe that a permanent census bureau could do much for obtaining accurate agricultural statistics. The officers of state boards of health

believe that vital statistics could be improved through the direct or indirect agency of a permanent bureau. Officers of insane asylums hold that a permanent bureau could contribute greatly to a more perfect knowledge of the insane in this country.

Much the same tendency is to be noted in the letters from statisticians. The question of organization, however, receives more attention from them. The European statisticians, who know no other method, approve completely the idea of a permanent bureau, and give some account of the form of organization in their respective countries.

The question, what shall be the scope of the proposed bureau, is one partly of function and partly of organization,—a question of function as to the extent of the inquiries, a question of organization in its relation to the other statistical work of the government. It is the weak point of the report and the bill that this question is avoided. There can be little doubt that the efficiency of the proposed bureau is largely dependent on the character of its work in the years intervening between the decennial censuses. It would seem advisable that that work should be clear and well defined. It would seem essential that if the proposed bureau is to mould our future statistics, it should occupy a commanding position in the statistical work of the government. Furnished with an appropriation as estimated in the report, only slightly in excess of that now enjoyed by the Department of Labor, and without clearly defined relation to the statistical work now going on in that department, and in the Treasury, State, and Agricultural departments, in the Bureau of Education, the Geological Survey, the Fish Commission, and the Interstate Commerce Commission,* it would seem that the proposed bureau could not fill the role which might naturally be expected.

It will be seen from the bill that the scope of the Bureau's work is as wide as that of the Census. The superintendent speaks of possible work in Agriculture, Mining, Fisheries, Transportation, and Education. This must clearly conflict with the present bureaus at work, and it seems unfortunate that no attempt has been made to fix the relations between them. The question is a delicate one, and it is easily understood why it should be avoided. But to our view it is a question which must be met in the long run. Some of the communi-

* See Willoughby, *Statistical Publications of the United States Government, Annals of the American Academy of Political and Social Science*, vol. II, p. 236 (Sept., 1891).

cations speak of the question in a tentative way, and suggest as possible solutions either the centralized bureau or the commission plan. Either plan would be an improvement, would give a higher character to the work as a whole, and would render duplication impossible. The advantages of each system are familiar to statisticians. The reorganization of the statistical work of the government seems a prerequisite of any advance through a permanent census bureau, and it is much to be regretted that the report and bill under discussion do not grapple with this question.

A bill (S. 1201) of purely administrative import has been introduced as an amendment to the act to provide for taking the Eleventh Census. It extends the penalties for a refusal to give information to census inquiries to companies, firms, and persons engaged in any productive industry.

No special collection of wages will take place in the Eleventh Census apart from the treatment of the subject under the various industries. A resolution (S. R. 20) has been introduced into the Senate contemplating the continuation of Volume XX of the Tenth Census. It authorizes the Superintendent of the Census to employ Mr. Jos. D. Weeks, of Pittsburgh, to do this work, and appropriates fifty thousand dollars for the purpose.

An echo of the Farmers' Alliance is found in a bill (S. 670) introduced by Senator Pepper (by request). It provides for a special census, asking of persons, firms, associations, and incorporations the value of property owned, the amount of debt and interest on the same, the amount of "use-money paid for use of rooms, buildings, grounds, or anything else." The intent of the act is mentioned "that the people may know how to legislate on the money question." A curious feature is a provision for the publication of the names of all persons who refuse to answer the questions.

ROLAND P. FALKNER.

REVIEWS AND NOTICES.

STUDIES IN JEWISH STATISTICS.

Studies in Jewish Statistics, social, vital, and anthropometric. By Joseph Jacobs. London, 1891. Pp. 59, lxix 13.

Since many theories concerning the Jews are based upon insufficient or inaccurate data, the author has attempted to bring together in this little book "a larger quantity of statistical material than is elsewhere available" in regard to this race. On the subject of consanguineous marriages the writer concludes that about $7\frac{1}{2}$ per cent of all Jewish marriages in England are between first cousins, a considerably greater proportion than Mr. G. H. Darwin calculated as taking place among the English in general, and probably a larger percentage than would hold true of Jews on the continent. Apparently, though not certainly, such marriages are more fertile than others; but Mr. Jacobs does not think that it is at all established that the offspring are unusually subject to physical or mental ills.

"One of the most firmly rooted ideas in the popular mind is that all Jews are rich." "Perhaps one of the causes of the idea has been that the Jewish poor have never been a burden to the general population, but have been entirely supported by the Jews themselves." The Jews of Asia, Africa, and Eastern Europe are poor; it is only in Western Europe and America that the wealthier are to be found. Confining the attention to the London Jews, it is estimated that 14.6 per cent have incomes averaging £367, 42.2 per cent £54, 19.6 per cent £26, and 23.6 per cent £12. During the year specially investigated it appeared that about one in four had been aided to a greater or less extent by their co-religionists, though the number of actual paupers was only one-half of 1 per cent. A few were rich, the many poor,—no middle class.

A much larger proportion of Jews than of the general population live in cities, and it is therefore impossible, or at least unfair, to attempt a comparison of occupations as between them and other races. Religious considerations and legal restrictions have had much to do with drawing the Israelites into the larger towns. It would be an

interesting question to determine to what extent their disproportionate congregation in cities is responsible for "their larger proportion of mentally and physically afflicted, their smaller bodily size, and the general 'movement' of the Jewish population." Commerce seems to attract about three times as great a percentage of Jews as of Christians, though it should also be added that the handicrafts claim a much larger proportion than is conceded by anti-Semitic orators and pamphleteers. In law, medicine, and literature on the continent, but not in England, Jewish names figure much oftener than in the general population, this being especially true of Austria-Hungary and Prussia; and in the universities also their proportion is high.

From a comparison of statistics of a considerable number of countries it appears that Jews marry younger, and, at the same time, less frequently than Christians, have a smaller birth rate according to population, but larger according to marriages; a smaller death rate, particularly under five years of age, and perhaps a slightly greater longevity. Jews are shorter and narrower than other European races, have darker hair and eyes, and, strangely, a larger percentage of red-haired persons.

There is much other interesting and suggestive matter in this work, to which it will be impossible to call attention. Those interested are therefore urged to refer directly to Mr. Jacobs's temperate and unprejudiced discussion.

CHARLES F. A. CURRIER.

THE WOOL BOOK.

A Statistical Manual Containing the Latest Official Data of the Production, Movement, and Consumption of Wool in all Countries. Compiled for the National Association of Wool Manufacturers, by S. N. D. North, Secretary, Boston, 1892.

This little volume is another illustration of the increasing tendency in all large lines of business to predicate enterprise upon authenticated statistical data. This has long been true in cotton, in iron and steel, and in other lines. The present publication is, we believe, the first attempt in any country to supply a commercial handbook containing all the attainable data regarding the world's production and consumption of wool.

There were great difficulties to be overcome in its compilation on account of the different methods of ascertaining and recording wool production and sales, the conflicting official statements, and the meagerness of data from distant and semi-barbarous countries that supply a large portion of the world's clip. The compiler has been careful to state the authority for his figures in every case; and where they conflict he has made no effort to reconcile them. A striking illustration of these discrepancies is found in the different totals of the number of sheep in the United States, given by the Census office and the Department of Agriculture, a difference which warns us again that it does not follow because statistics are labelled "official" and duly certified that they can be implicitly relied upon. This volume shows that for years the official estimate, by the Department of Agriculture, of the total wool clip of the United States has been from 20,000,000 to 30,000,000 pounds less than the commercial estimates; and it is significant that the commercial estimate should be the one generally accepted in the trade as nearest the fact.

The reader of *The Wool Book* will be impressed by the fact that the English have much closer methods of calculating their annual wool supply and consumption than our own people; that the French are also far behind the English in this respect, and the Germans far behind the French. These four countries are recognized as the great wool manufacturing nations, Great Britain standing first, France and the United States following close behind in the order named, and Germany not far behind either. In these four countries two-thirds of the world's wool product are worked up.

The Wool Book makes an original estimate of the total wool clip of the world, which will attract attention because it is larger than any before given. It is founded upon the table of F. X. von Neumann-Spallart, of Stuttgart, as published in the *Übersichten der Welt-Wirtschaft*, where the annual wool supply is figured at 1,983,396,000 lbs., and upon the London Board of Trade estimates, which place the world's wool clip at 1,950,000,000 in 1890. The present estimate puts the total at 2,456,773,000; and as the estimated production of each country is given in detail, there is opportunity for those who think the total too large to show where any error has been made.

We may conclude this notice by calling attention to the great aid which is given to statistical science and investigation by publications for purely commercial purposes, of which this book is a type. Col-

lected within the compact space of a hundred odd pages, carefully indexed and arranged, we have here all the data required for the close study of one of the greatest of our economic problems, much of it drawn from sources not ordinarily available to students of statistics and of political economy. Students of that problem, in any of its aspects, may save themselves many hours of wearisome search in libraries by consulting its pages.

DIVORCE STATISTICS IN THE UNITED STATES.

The following paragraphs, from the last annual Report of Rev. Dr. S. W. Dike, Secretary of the National Divorce Reform League, for the year ending December 31, 1891, indicate the recent development of statistics of divorce.

Some will remember that we have pointed out the great aid the census might have given in determining what proportion of the 20 per cent of the divorces of the United States, which are obtained in states other than the one in which the marriage took place, belong to those sought by non-residents. Had the population, under the census of 1880, been classified both by conjugal condition and place of birth, instead of the latter alone, Mr. Wright could have shown this. I laid this need before the Superintendent of the present census, and he assures me that this work shall be done for 1890, and perhaps for the previous census from the original schedules. This will enable us to compare, for example, the number of married persons in California who were born in New York with the number divorced in California who had been married in New York, as the latter fact was brought out in the report of Mr. Wright. In this way a reasonably good estimate can be made of the extent of migration expressly for easy divorce.

STATE REGISTRATION REPORTS.

The importance of extending a common system of the registration of marriages and divorces over the country was presented in our Report for 1890. It was especially urged that every license for a second marriage should give the previous conjugal condition, whether single, widowed or divorced, as well as the date and place of the dissolution of the former marriage. The sociological value of these facts would be great; and so would their practical uses in rendering biga-

mies more difficult, and in settling the vexed question as to the influence of a desire for re-marriage upon the increase of divorces. Connecticut for two years reports the number of divorced persons married each year. In 1889 there were 286 such,—135 men and 151 women,—which is a little above one-third the number divorced in the year. In 1890 there were 477 divorces granted, or 954 individuals divorced; and there were 350 divorced persons—this year 207 women and 143 men—who married again during the year. An extended induction along this line should be possible. Guesses based on mere observation are untrustworthy guides in legislation or social reform.

A critical study of the Report of Mr. Wright, especially for its light upon the extent to which legislation operates to increase or decrease Divorce, the work of a young man of much promise, and written as a thesis for the degree of Doctor of Philosophy, was published by Columbia College as the first of its series of issues on Social Problems. But though an able work, and founded on much study of Mr. Wright's Report and other documents, it proved less valuable than was expected. A lack of experience in affairs and practical statistics, as in the case of many young writers, gave occasion for serious errors, some of which I felt compelled, by the use that was being made of them, to point out in a letter to the New York *Evening Post* of July 2, 1891. It is probable that the author will make important corrections if this interesting monograph is republished. His main contention, that legislation has less restrictive power than many seem to think, is quite in accord with the facts.

CAUSES OF POVERTY.

The December number of the British *Economic Journal* contains a monograph on the "Causes of Poverty," by Miss Helen Dendy. This author bases her article upon the records of 152 families, which were not self-supporting, as shown by their application for charitable assistance. The period of her investigation covers both summer and winter months, and as the cases were chosen indiscriminately from a wide district containing over 126,000 people, and having nothing in common save their poverty, they can stand as representing the class of unemployed.

Miss Dendy's results are arranged in the following crude table, which she describes as "necessarily more or less imperfect and rough." But it may, perhaps, illustrate the nature of the unemployed—labor problem:—

I.	II.	III.
Rockless improvidence, . . 5	Ordinary illness, 28	Decay of trade, 4
Crime, 4	Want of stock (periodical) 3	Extraordinary slackness, . 3
Drink, 19	Old age unprovided for, 10	Emergency, 9
Idleness, 6	Ordinary slackness, . . . 12	Extraordinary illness, . 20
Desertion, 5		Incompetency, 21
Bad temper, 3	53	57
42		

The cases represented by the first group cannot be prevented by any external means, and must necessarily exist in the present stage of civilization. Drink is the most potent cause of distress in this group. Idleness and drink often go hand in hand, but both are frequently found as distinct causes of poverty. Bad tempered people are generally out of employment because of their quarrelsome natures. The number of cases given as due to desertion (5) gives no adequate idea of this cause of distress, for such cases come directly under the poor laws. In none of the cases in the first group can poverty and distress be laid to lack of work.

In the second group "ordinary illness" includes only what every individual might reasonably expect, and for which provision might be made. "Want of stock" represents the cause of distress of a class of people who habitually consume both capital and profit, trusting to chance for help when it is needed. "Ordinary slackness" represents the normal amount "of out of work" in certain trades, but the laborers of this class are compensated by higher wages during the busy season. This should cause no distress (except, perhaps, when the slack season is longer than usual) were it not for the habit of spending money as soon as earned.

The amount of distress caused by "decay of trade" is small, for a competent man can adapt his skill to some similar form of industry. "Emergency" includes cases such as loss by fire or sudden death, which cannot be averted. Illness is "extraordinary" when no degree of thrift or foresight could maintain the family in independence. Consumption is the leading cause of distress in this class of cases. Finally,

we find people who are compelled to ask for aid, not because of any particular deficiency, but because of lack of ability. When once taught a trade, however, these people can generally find work; and here, no doubt, there is chance for charitable aid.

In this classification careful inquiry was made in each case. The necessary information was obtained from relatives, landlords, and employes.

G. N. CALKINS.

STATISTICAL ARTICLES IN GERMAN PERIODICALS AND JOURNALS.

Jahrbücher für Nationalökonomie und Statistik. February, 1892.

Die Entwicklung der Britischen Landwirthschaft unter dem Druck ausländischer Konkurrenz. By Prof. Dr. Paasche.

This traces the development of British agriculture since the abolition of the corn laws, and every page bristles with statistical evidence. Long rows of figures give the imports of each staple with the amounts shipped from each food-producing country. Other tables show the diversification of British agriculture itself. All this leads to the conclusion that the principal cost of cheap food for the inhabitants of Great Britain has been the burden of decreased rents falling upon the land-owners.

Die Verwaltung der Stadt Berlin in den Jahren 1882-1888. By E. Loening.

This presents a discussion of the recently published statistics of the Berlin city government. The city has continued in the line of development begun in 1860. The population has increased 3.46 per cent yearly,—an addition traceable both to immigration and to an excess of births over deaths. At the same time the basis for taxation has grown at an even more rapid rate; that is, the income return has increased 6.11 per cent annually. Not only have the tax receipts risen from 24,198,519 marks in 1882-83 to 33,461,753 marks in 1888-89, but also the surplus from the administration of the municipal monopolies from 31,382,626 marks to 44,767,393 marks in the same years, respectively.

One-fourth of the city's income was expended upon its schools, 15 per cent upon its streets and bridges, and a smaller proportion for

street lighting and cleaning, for poor relief, for police surveillance, for pensions, etc. The municipal gas and water works, the slaughter house, canals, markets, have all been more or less extended. Upon this huge municipal plant the total debt is 163,340,125 marks. The next problem to be dealt with, says Herr Loening, lies in the annexation of the various suburbs, which the rapid growth of Berlin has made practically at one with that city. Many economies are to be expected from such centralization.

Die Zunahme der Bevölkerung in den hauptsächlichsten Kulturstaaten während der letzten Dezennien. [March, 1892.

This is a table collecting, from official sources, the statistics of population of the chief civilized countries for the period during which they have been regularly gathered. The states compared are: the German Empire, Prussia, Bavaria, Saxony, Wurtemberg, Baden, the United States, France, Great Britain and Ireland, England and Wales, Scotland, Ireland, Sweden, Norway, Austria, Hungary, Holland, Belgium, Russia, Denmark, Italy, Spain, Switzerland, and Portugal.

VICTOR ROSEWATER.

Schmoller's Jahrbuch. XVI. No. 1.

Der Wiener Weltpost Kongress. By J. Jung.

The congress of delegates from the various countries comprised within the universal postal union, which met in Vienna in 1891, furnishes occasion for a review of the growth and extent of the world's postal business. The suggestion made in 1868 by Minister Stephan, then in charge of the postal system of the North German Confederation, bore fruit in 1874, when a convention was signed in Bern by the representatives of 22 states, with some 350 million inhabitants. The new postal convention effected at Paris in 1878 bore the signatures of delegates from 32 states, with a population of about 750 million people. The union has since then become more and more complete; embracing in 1891 over 60 countries with 946 million inhabitants.

The postal traffic within the union has increased from, in round numbers, 3300 million transmissions in 1873 to 15,000 million in 1889, classified roughly into 7000 million letters, 1600 million postal cards, 5700 million pieces of printed matter, 100 million articles of merchandise, 220 million postal money orders, 260 million packages, 60 million registered letters, 40 million postal notices and pieces forwarded.

Detailed tables and charts are given, showing the increase in the internal and foreign postal business of Germany. Similar statistics for the whole postal union would be much more interesting and useful; we may hope that the next postal congress, which is to meet at Washington in 1897, will provide the missing material.

Die Entwicklung der Fachvereine in Frankreich 1891. By Dr. M. v. d. Osten.

Dr. von der Osten gives the following table from the *Annuaire des Syndicats Professionnels*, as illustrating the rapid increase of trades unions in France, since the law of 1884 legalized such combinations.

On July 1.	Unions of Employers.	Unions of Employes.	Unions with Mixed Membership.	Total.
1884	101	68	1	170
1885	285	221	4	510
1886	359	280	8	647
1887	598	501	45	1,144
1888	859	725	78	1,662
1889	877	821	69	1,767
1890	1,004	1,006	97	2,107
1891	1,127	1,250	126	2,503

On the 1st of July, 1891, the number of members in the unions reported were 106,157 employers, 205,152 employes, and 15,773 members of mixed unions. The list of objects for which their activities are exerted include funds for sickness, injury, temporary lack of employment, trade schools, libraries, and employment bureaus.

VICTOR ROSEWATER.

Allgemeines Statistisches Archiv. II. No. 1.

Die Jahresschwankungen in der Häufigkeit verschiedener bevölkerungs und moralstatistischer Erscheinungen. By Dr. K. Becker.

This most interesting paper, originally read as an address before one of the scientific societies of Berlin, deals with the statistical phenomena recurring regularly each year, as illustrated particularly by the materials gathered by the German imperial statistical bureau. While in many cases such variations are ultimately dependent upon changes in season and temperature, yet the causation is seldom as direct as in the appearance of sunstroke, or death by freezing. One of the important factors is seen in the semi-annual terms upon which

houses are rented. The announcements of removal of residence in Berlin rise above the monthly average only in October and April. In these months not only is the weather unusually favorable, but also better opportunities are offered for securing new quarters.

In like manner the statistics of emigration to foreign lands display two annual periods of extraordinary activity. The maximum comes in April, then a decrease until July, after which the increase again continues to October. Dr. Becker, in order to reduce these variations to a scientific basis, treats his figures in this way: After finding how many such events would occur each month if they were evenly distributed throughout the year, he takes the result as 100 upon his scale, and then expresses the number which actually did occur in each particular month in figures relative to this norm. Thus calculated, the statistics of emigration for the years 1872-89 become, according to the time of sailing, January, 26; February, 52; March, 132; April, 207; May, 173; June, 105; July, 80; August, 93; September, 105; October, 126; November, 73; and December, 28.

Similarly calculated, statistics of marriage for the years 1872-85 give more frequent variations. The figures are: December, 76; January, 97; February, 118; March, 58; April, 115; May, 124; June, 91; July, 84; August, 68; September, 92; October, 112; November, 153. Here, besides the seasons, the terms of house rents, of employment contracts, and the church festivals exercise noticeable influence. Reduced to a chart, we have a line rising and sinking three successive times, and this curve resembles those for the separate commonwealths of the empire, although differing slightly from those for other European countries.

The influence of the marriage curve upon that for the total number of births is almost imperceptible. Throwing the date of birth back nine months, in order to get the time of conception, Dr. Becker arrives at these results for the German Empire on the averages of 1872-85: January, 100; February, 99; March, 99; April, 102½; May, 105½; June, 103½; July, 100; August, 97; September, 95; October, 95½; November, 98; December, 105. Thus, the curve swells twice annually. The statistics of conceptions leading to births of illegitimate children, on the other hand, form a curve with but one annual swell, the maximum occurring in May and far above either maximum for the total births. From this Dr. Becker concludes that the seasons have much more direct influence upon births of illegiti-

mate than of legitimate children. Very different is the curve of the still-born. It rises and sinks but once annually, but the height falls in the cold month of January, and the depth in moderate September.

Upon the general death rate, too, may be traced the influence of wintry cold and summer heat. The two maximums come in March (110) and August (101), respectively, and the two minimums in October (91) and June (95). The greatest deviations from the average appear in the cases of infant death. A similarly constructed curve for the phenomena of suicide shows one huge swell from 70 in December to 126 in June, the maximum in the summer when the day is longest, not in the winter as might have been expected.

Like annual variations in the statistics of crimes of every sort are dealt with and illustrated by graphical charts, showing the resulting curves.

VICTOR ROSEWATER.

Zeitschrift für Schweizerische Statistik. XXVII. No. 3.

Zehn Basler Arbeiterhaushaltungen. By Carl Landolt.

The wages question continues to attract attention in all parts of the civilized world. We have here a new investigation for Switzerland, chiefly on the side of workingmen's budgets. The method pursued is interesting. Herr Landolt began his study in November, 1888, when he persuaded three reliable laborers to conduct household accounts according to prescribed rules. One was soon forced to choose between giving up his bookkeeping and giving up his situation; nor did the work of the others proceed satisfactorily. The *Basler Arbeiterbund* was therefore appealed to, and with its assistance eighty members were induced to participate in the scheme. They were required, first of all, to take an inventory of their entire property, and then to meet regularly from time to time for inspection and correction of accounts. The number of laborers who persisted in the undertaking gradually fell off to seventeen, and Herr Landolt finally secured fifteen reliable accounts covering a period of one year. Owing to lack of time, only ten of these have been compiled. The books give a chronological record of income and expenditure with the exact quantities of every purchased article. Unaccounted expenditure was so controlled by means of semi-monthly or monthly balances that this item, usually quite large, was reduced to an average of 9 per mill of the total expenditure. This adds greatly to the reliability and accuracy of the resulting computations.

The ten families under consideration comprise fifty-four members, of whom twenty-three are wholly or in part self-sustaining, and occupied mostly with work requiring some small degree of skill. The wife, in eight out of ten instances, is engaged in remunerative employment. The family is made up, on the average, of two adults and three minors. Their dwellings are not what would be desired, failing generally to afford sufficient air space per person. As a result of this, the health of the occupants is more or less affected, though not at all bad considering the circumstances. The inventory of property is closely connected with the earning capacity of the family. Herr Landolt has classified two households as very poor, three as poor, three as moderate, and two as comparatively well-fixed.

The average total annual income per family was 1825.71 francs. Of this the average earnings of the husband constitute 73.8 per cent; of the wife, 10.8 per cent; of the children, 6 per cent, while 9.4 per cent is obtained from other sources. While the average cash on hand at the commencement of the account was 68.7 francs, only 58 francs remained at the end. The laborers, with one exception, were not able to save anything, much less to be able to make adequate provision for the future. Any slight emergency might bring them within the bounds of pauperism.

VICTOR ROSEWATER.

Vierteljahrshefte zur Statistik des Deutschen Reichs. Herausgegeben vom Kaiserlichen Statistischen Amt. Erster Jahrgang, 1892. Erster Heft. Berlin, 1892.

This new publication will deal with such subjects as indirect taxes, on beer, brandy, salt, playing cards, tobacco, sugar; coal, iron, and salt production; the crops; births, marriages, and deaths; emigration; it will also give selections from annual returns on special matters, like foreign commerce, foreign and domestic shipping, criminal and insurance statistics; and, finally, it will tabulate the more infrequent reports,—the census, the votes at elections to the Reichstag, and the like. It is possible to call attention to only a portion of the contents of the present number.

The census of December 1, 1890, is summarized, showing that the population of the Empire was then 49,428,470; the percentage of gain annually from 1885 to 1890 was about the same as prevailed from 1871 to 1880, being a marked improvement over the period 1880–85, when emigration was unusually large. The marriage rate

has increased a trifle during the past ten years, whereas the birth and death rates have slightly diminished. There is a suggestive table comparing, for the years 1884 to 1890, the movement of population in the German Empire, France, Great Britain, Ireland, and Italy. The emigration statistics for 1891 are not quite complete, the number of Germans sailing from French ports is lacking; but reckoning these at the nearly constant average from such ports for the preceding four years, the total emigration from Germany during 1891 was rising 120,000,—23,000 more than in 1890, and the largest number since 1884. The usual proportion of about 90 per cent came to the United States.

German shipping has made great advances in the last decade, though the number of sailing vessels between 1880 and 1891 was reduced from 4403 to 2757, and the tonnage from 974,943 to 709,761. The steamships, on the other hand, increased from 374 to 896, and their tonnage from 196,343 to 723,652. In 1891 one-half the total tonnage was under steam; in 1880 only one-sixth. It is noticeable that the main increase in tonnage is in the larger ships, especially in those of more than 2000 tons.

C. F. A. CURRIER.

Statistische Monatschrift. Vienna, January, 1892.

Die überseeische österreichische Auswanderung, insbesondere in den Jahren 1889 und 1890. By Dr. Friedrich Probst.

Dr. Probst treats his subject from two points of view, namely, the returns of emigration from European ports and of immigration into foreign lands. Figures from the first-mentioned sources give a total of 55,667 emigrants from Austria-Hungary in 1889, and 74,002 in 1890. But, inasmuch as the returns are notoriously incomplete, these results fall somewhat short of the actual facts. Two-thirds of the emigrants recorded are males, 20 per cent under 15 years of age, and about 10 per cent over 40 years of age. In the year 1890, this emigration neutralized 22 per cent of the natural increase of population by excess of births over deaths.

Similar figures are given for the immigration from Austria-Hungary into various states of North and South America; these, however, are necessarily fragmentary. Dr. Probst emphasizes the difficulties and disadvantages which attend the emigrant wherever he goes, and insists that of the 30 to 40 thousand people who leave Austria-Hungary for foreign shores annually not more than 10 thousand have their expect-

tations even half-way realized, while 20 to 30 thousand are compelled to eke out the remainder of their existence in a most pitiful manner. State interference is the remedy recommended.

Die gewerbliche Genossenschaften in Oesterreich zu Ende des Jahres 1891. By Dr. Schmid.

This paper shows statistically the condition and extent of industrial societies in the Austrian kingdom. In 1883 the total number was 2870; in 1890, 5113, of which 722 were unions for particular trades, 2252 unions for groups of allied trades, and 2139 unions for the combined trades of a specific locality. Of these societies 2857 possessed funds for mutual aid, 2657 had arbitration committees, 808 kept general sickness funds, and 195 had funds for the aid of sick apprentices. The 722 simple trades unions comprised 112 different industrial occupations.

Mittheilungen des Statistischen Amtes der Stadt Dresden.

Wochen-Berichte des Statistischen Amtes der Stadt Dresden.

Monatsberichte des Statistischen Amtes der Stadt Dresden.

In January, 1891, the city of Dresden, Germany, began the publication of occasional, weekly, and monthly statistical reports. The weekly reports embrace such subjects as marriages, births, deaths, the gas and water supply, slaughter-house returns, an exhaustive list of market prices, the weather, etc. The monthly publication summarizes the vital statistics and also those pertaining to the consumption of gas and water, but is devoted chiefly to information not otherwise supplied, such as criminal and other police returns, reports from hospitals and other charitable organizations, movement of the population, the amount of building going on, savings bank and loan operations, octroi receipts, and vacant dwellings classed according to rental. C.

QUARTERLY PUBLICATIONS OF THE
AMERICAN
STATISTICAL ASSOCIATION.

- I. A STATISTICAL INQUIRY CONCERNING DOMESTIC SERVICE. BY LUCY M. SALMON.
II. THE THEORY AND PRACTICE OF PRICE STATISTICS. BY ROLAND P. FALKNER.
III. MEASURES OF DISTRIBUTION. BY GEORGE K. HOLMES.
IV. STATISTICS OF SUICIDES IN NEW ENGLAND. BY DAVIS R. DEWEY.
V. SEMI-ANNUAL CENSUS OF PAUPERS IN MINNESOTA. BY H. H. HART.
VI. REVIEWS AND NOTICES: A STATISTICAL STUDY OF ILLEGITIMACY, *Charles F. A. Currier*; MORTGAGE INDEBTEDNESS IN EUROPE, *George K. Holmes*; STATISTICS OF DIVORCE IN FRANCE, *G. N. Calkins*; ANTHROPOMETRY; A UNIVERSITY COURSE IN STATISTICS; STATISTICS OF PRISONERS, 1890; A CORRECTION.
VII. CONVENTION OF COMMISSIONERS OF BUREAUS OF LABOR STATISTICS.
VIII. NET PROFITS OF MANUFACTURING INDUSTRIES IN THE STATE OF MASSACHUSETTS. BY W. F. DRAPER.
IX. INTERNATIONAL STATISTICAL COMPARISONS.
-

BOSTON:
AMERICAN STATISTICAL ASSOCIATION.
1892.

COPYRIGHTED, 1892, BY AMERICAN STATISTICAL ASSOCIATION.

CONTENTS.

I. A STATISTICAL INQUIRY CONCERNING DOMESTIC SERVICE. <i>By Lucy M. Salmon.</i>	89
II. THE THEORY AND PRACTICE OF PRICE STATISTICS. <i>By Roland P. Falkner.</i>	119
III. MEASURES OF DISTRIBUTION. <i>By George K. Holmes.</i>	141
IV. STATISTICS OF SUICIDES IN NEW ENGLAND. <i>By Davis R. Dewey.</i>	158
V. SEMI-ANNUAL CENSUS OF PAUPERS IN MINNESOTA. <i>By H. H. Hart.</i>	176
VI. REVIEWS AND NOTICES:—	
A Statistical Study of Illegitimacy. <i>Charles F. A. Currier.</i>	179
Mortgage Indebtedness in Europe. <i>George K. Holmes.</i>	181
Statistics of Divorce in France. <i>G. N. Calkins.</i>	184
Anthropometry.	185
A University Course in Statistics.	186
Statistics of Prisoners, 1890.	191
A Correction.	192
VII. CONVENTION OF COMMISSIONERS OF BUREAUS OF LABOR STATISTICS.	187
VIII. NET PROFITS OF MANUFACTURING INDUSTRIES IN THE STATE OF MASSACHUSETTS. <i>By W. F. Draper.</i>	192
IX. INTERNATIONAL STATISTICAL COMPARISONS.	199

AMERICAN STATISTICAL ASSOCIATION.

NEW SERIES, Nos. 18, 19.

JUNE, SEPT., 1892.

Read before the AMERICAN STATISTICAL ASSOCIATION, May 13, 1892.

A STATISTICAL INQUIRY CONCERNING DOMESTIC SERVICE.

BY LUCY M. SALMON, A.M.,

PROFESSOR OF HISTORY, VASSAR COLLEGE.

During the summer of 1888 a statistical inquiry concerning domestic service was begun by the department of history, Vassar College. The investigation grew out of a belief that, while much had been written in regard to domestic servants, there had been little serious study of domestic service. No investigation of the question had been made by the United States Bureau of Labor, and of the twenty-two state bureaus only two had given any attention to the subject, and in both cases only partial reports had been made. In the reports of a few other bureaus the subject had been treated incidentally in connection with the general question of woman wage-earners. Its exclusion from statistical presentations of the labor questions had not been surprising since the various bureaus of labor, both national and state, consider only those subjects for the investigation of which there is a recognized demand. They are the leaders of public opinion in the accumulation of facts, but they are its followers as regards

choice of questions to be studied. Public opinion has not yet demanded a scientific treatise on domestic service, and until it does the bureaus of labor cannot be expected to supply the material for such discussion. In default of statistical and industrial information concerning domestic service as an occupation, the personal element in the relationship of employer and employe has been made the basis of all propositions for securing an improvement in the service. It was with the view, therefore, of ascertaining some of the industrial conditions under which domestic service is given and received that three schedules were prepared, one to be filled out by employers, one by employes, and a third miscellaneous in character.

The schedule for employers called for four kinds of information. The first related to servants, and included facts concerning the kind of service in which they were employed, the number so employed, place of birth, time in the service of their present employers, the amount of wages and rate of payment, and whether with or without board, the actual number of hours engaged in work, free time allowed each week, and vacation granted during the year, and whether with or without loss of wages. The second class of facts desired related to the industrial conditions under which service is given. They comprised information regarding the community, whether residence was in a city, village, suburb, or in the country, the leading industries of the locality, and to what extent women had been employed in these industries. The third class of facts sought concerned industrial conditions within the household, and included the length of time the employer had kept house, the number of servants employed during that time, the length of time boarded, the number of persons in the family, and whether the wages paid were higher or lower than during previous years. The fourth class of questions called for expressions of opinion as to the nature of the service rendered, whether it had been excellent, good, fair, or poor; whether it had been found difficult to secure

good domestic service, and what explanation of the difficulty could be given.

The schedule sent employes called for two classes of answers. The first concerned the facts relating to place of birth, the number of years engaged in domestic service, the length of time with present employer, the number of previous employers, wages received, the highest and lowest wages received from previous employers, whether the employe had ever been engaged in any occupation besides domestic service, and, if so, the nature of the employment, with a statement of the highest and lowest wages received in it. The second class of answers expected concerned the reasons why housework had been chosen as an occupation, what reasons could be given why more women do not choose domestic service as a regular employment, and whether the employe would give up housework if another kind of work paying equally well could be found.

The third schedule asked for information in regard to training schools for domestic employes, public and private schools where household employments are taught, women's exchanges, co-operative housekeeping, food prepared at home for sale elsewhere, housework done by the piece or by the hour by persons other than regular servants, and a statement as to how far the results had been remunerative.

The schedules were printed and submitted to Hon. Carroll D. Wright and to Mr. C. F. Pidgin, whose work on "Practical Statistics" had been of help in making the original draft. These gentlemen gave valuable suggestions, and, after several printed revisions, twenty-five hundred sets of the blanks were distributed in January, 1889. They were sent out in packages of from five to twenty-five through the members of the class of 1888, Vassar College, and also through personal acquaintances. As a sufficient number of replies was not received, a second edition of twenty-five hundred sets was sent out in December, 1889. These were distributed through the class of 1889, and sets were also mailed, with a statement

of the object of the work, to the members of different associations presumably interested in such investigations. These were the American Statistical Association, the American Economic Association, the Association of Collegiate Alumnae, the Vassar Alumnae, and the women graduates of the University of Michigan. They were also sent to various women's clubs, and many were distributed at the request of persons interested in the work.

Of the five thousand sets of blanks thus sent out, 1025 were returned filled out by employers, twenty being received after the tabulation was completed. These gave the facts asked for with reference to 2545 employees. The returns received from employers thus bore about the same proportion to the blanks distributed as do the returns received in ordinary statistical investigation carried on without the aid of special agents or legal authority. The reasons why a larger number was not returned are the same as are found in all such inquiries, with a few peculiar to the nature of the case. The occupation investigated is one that does not bring either employer or employe into immediate contact with others in the same occupation, and it is therefore believed that the relations between employer and employe are purely personal, and thus not a proper subject for statistical inquiry. Another reason assigned was the fear that the agitation of the subject would cause employes to become dissatisfied, while a third reason was the large number of questions included in the blanks, and the fact that no immediate and possibly no remote benefit would accrue to those filling them out. Another reason frequently assigned was that all of the questions could not be answered, and that, therefore, replies to others could not be of service. But several of the questions were framed with the understanding that in many cases they could not be definitely answered, as the question "How many servants have you employed since you have been housekeeping?" The fact that often no reply could be given was as significant of the condition of the service as a detailed statement could have been.

No success had been anticipated in securing replies from employes, but as any study of domestic service would be incomplete without looking at it from this point of view the attempt was made. As a result 719 blanks were returned filled out. In some instances employes hearing of the inquiry wrote for schedules and returned them answered. In a few cases correspondence was carried on with women who had formerly been in domestic service. The influences that operated to prevent employers from answering the inquiries made had even greater force in the case of employes. In addition there was present a hesitation to commit anything to writing or to sign a name to a document the import of which was not clearly understood by them.

The limited number of facts concerning which information could be given explains the small number of returns received to the third schedule,—about two hundred. The material thus secured will not be considered in this paper since it relates to subjects allied to domestic service rather than to the service itself.

The returns received were sent to the Massachusetts Bureau of Statistics of Labor, where, by the courtesy of the Chief of the Bureau, they were collated during the spring and summer of 1890 under the special direction of the chief clerk in accordance with a scheme of tables designed and presented by the writer. The general plan of arrangement adopted was to class the schedules with reference to employers, first alphabetically by states and towns, and second alphabetically by population. The schedules were then classed with reference to employes, first by men and women, and second by place of birth. The various statistical devices used in the Massachusetts Bureau were employed in tabulating the material and greatly facilitated the work, but it was at best a long and tedious process.

Fifty large tables were thus prepared, and by various combinations numerous smaller ones were made. The classification adopted made it possible to give all the results either in

a general form, or with special reference to men and women employes, the native born and the foreign born, and to all of the branches of the service. It was also possible to study the conditions of the service geographically, and with reference to the population and other industrial situations.

The most detailed tables made out concerned the wage question, including a presentation of classified wages, average wages with the percentage of employes receiving the same wages as the average and also more or less than the average, a comparison of wages paid at different times and of wages received in domestic service and in other employments. For the purposes of comparison, the writer also classified the salaries paid about six thousand teachers in the public schools in sixteen representative cities, as indicated by the reports of city superintendents for the year during which information concerning domestic service had been given on the schedules. Through the courtesy of a large employment bureau in Boston the wages received by nearly three thousand employes were ascertained and used for comparison. The most valuable results of the investigation possibly were those growing out of the consensus of opinion obtained from employers and employes regarding the nature of the service considered as an occupation.

The question must naturally arise as to how far the returns received through such investigation can be considered representative, and, therefore, how far it is wise for private individuals to undertake them on so extensive a scale. It is this phase of the subject rather than the more immediate problems affecting domestic service that this paper concerns.

It has seemed to the writer that the returns could be considered fairly representative. Investigations of this character must always be considered typical rather than comprehensive. It is difficult to fix the exact number to be considered typical as between a partial investigation and a census which is exhaustive. In some cases it is possible to obtain a majority in numbers, in others it is not. If the number of returns,

however, passes the point where it would be considered trivial, the number between this and the majority may perhaps be regarded as representative. By the application of a similar principle, the expression at the polls of the will of the twentieth part of the inhabitants of a state is recognized as the will of the majority. But, while the returns can be considered only fairly representative as regards numbers, they seem entirely so as regards conditions. It is believed that every possible condition under which domestic service exists, as regards both employer and employe, is represented by the returns received, and that therefore the conclusions drawn from these results cannot be wholly unreasonable. Moreover, the circulars were sent out practically at random, and therefore do not represent any particular class in society, except the class sufficiently interested in the subject to answer the questions asked. If the returns thus secured can be regarded in any sense as representative, the results based on them may be considered as indicating certain general conditions and tendencies, and, although the conclusions reached may be modified by later and fuller researches, they cannot be wholly overthrown.

Some specific reasons also lead to the same conclusion that the schedules may be used to denote conditions and tendencies.

The average family reached through the schedules numbered 4.86 persons. This does not vary materially from five, — the usual basis assumed.

It was found through the schedules that, of the total number of domestic employes represented, women formed 82 per cent and men 18 per cent. By the census of 1880 — unfortunately the latest available for this comparison — it was found that women formed 88 per cent of domestic employes and men 12 per cent. The slight discrepancy is explained by the fact that on the schedules choremen, furnace men, and other men employed in the house were classed as domestic

servants, while in the census enumeration they were denominated laborers.

The place of birth of employes represented on the schedules was as follows:—

TABLE I.
PLACE OF BIRTH OF EMPLOYES.

Person Reporting.	Number.			Percentages.		
	Native Born.	Foreign Born.	Not Given.	Native Born.	Foreign Born.	Not Given.
Employer.....	922	1,212	411	36.23	47.62	16.15
Employee.....	324	395	....	45.06	54.94	....

This shows that more than half the number considered were of foreign birth. In Massachusetts in 1885 the foreign born domestic servants formed 60.24 per cent of the entire number. This included only those persons in housework "engaged with remuneration."¹ In the Tenth Census of the United States it is found that, after eliminating the southern and border sections where the domestic servants are almost exclusively native born negroes, more than one-third of all domestic employes, 84.31 per cent, were, in 1880, of foreign birth.² As the ranks of domestic service have been recruited from the army of immigrants coming to this country since 1880, it is perhaps not unfair to assume that the above table represents the present tendency towards the employment as domestic servants of persons of foreign birth, especially in those sections most affected by foreign immigration.

The schedules also indicated the foreign countries having the largest representation in domestic service, as is seen by the following table:—

¹*Census of Massachusetts, 1885.* Part 2, pp. xxxvii—xxxviii.

²*Tenth Census.* Vol. I, p. 729.

TABLE II.
NUMBER OF FOREIGN BORN IN DOMESTIC SERVICE.

Place of Birth.	Person Reporting.			
	Employer.		Employee.	
	Number.	Per Cent.	Number.	Per Cent.
Ireland.....	653	53.88	217	54.94
Sweden and Norway...	147	12.13	50	12.66
Germany.....	128	10.56	37	9.37
Great Britain.....	122	10.07	32	8.10
British America.....	104	8.58	42	10.63
Other countries.....	58	4.78	17	4.30
Total.....	1,212	100.00	395	100.00

The condition of the service as regards place of birth did not vary materially from this in 1880, as is evident from the following table which indicates the place of birth of all persons of foreign birth engaged in domestic service and the per cent of each nationality so engaged:—

Ireland,	47.73
Germany,	16.97
British America,	8.62
Great Britain,	7.61
Sweden and Norway,	7.45
Other Countries,	11.62

The variations of this table from Table II are indeed a confirmation of the representative character of the former. The relative rank of Sweden and Norway is much lower in the table drawn from the Census than in that taken from the schedules. But the emigration from Sweden and Norway had steadily declined from 1869 to 1879¹ and this materially affected the number in domestic service as given in the Tenth Census. In 1879 emigration from these countries revived and increased more than 25 per cent, reaching a maximum in 1882. This increase in numbers has shown itself in

¹*Arrivals of Alien Passengers and Immigrants in the United States from 1820 to 1890*, pp. 24-25.

domestic service, for in the proportion of women arriving in this country from 1881 to 1890, inclusive, Ireland ranks first, Germany second, Sweden and Norway third, and England fourth.¹ It has been noted in various census reports, national and state, that the concentration of women of foreign birth engaged in remunerative occupations is on domestic service. It is also true that, considering the proportion of persons coming to the United States at the age when persons most naturally enter domestic service,— between fifteen and forty-five,— Ireland ranks first, Sweden and Norway second, England third, and Germany fourth.²

A second variation of Table II from the census returns concerns the percentage of persons born in "other countries." But here again the variation proves rather the representative character of the schedules. It is impossible to state the exact number of Chinese in domestic service in 1880, owing to the defective classification of occupations in the census of 1880, but presumably the 11.62 per cent in domestic service born in "other countries" are Chinese.³

Another indication of the general representative character of the schedules comes from their geographical distribution. Replies were received from thirty-six states and the District of Columbia and from 338 different cities and towns. Of these 338 places 38 are classed by the Census Bulletin No. 52 as among the fifty largest cities in the United States in

¹ *Ibid*, p. 9. ² *Ibid*, p. 10.

³ This assumption is made because the total number of men engaged in the occupation at that time is given as 136,745. Of these 102,230 were born in the United States, and 17,516 in either Ireland, Germany, Great Britain, Norway, Sweden, or British America. Those born in "other countries" number 16,999, or twelve per cent of the entire number of men in domestic service. Among women those born in "other countries" form only one per cent of the entire number of women in domestic service. As China is the only country not specifically enumerated in the census in which men are to any considerable extent engaged in domestic service, it is fair to assume that the 11.62 per cent born in "other countries" are mainly Chinese. At the time represented by the schedules the prohibitory act of 1888 was in force, and after the restriction act of 1892 the immigration to this country from China had been nominal. Between 1848 and 1876 the average annual departures had formed 40 per cent of the number of arrivals (*R. M. Smith, Emigration and Immigration*, p. 237), and if this same rate of departures was subsequently maintained, in 1889-1890 the number of Chinese in this country must have been comparatively small. It seems probable, therefore, that the percentage born in "other countries," 4.3, as represented on the schedules, was approximately correct. In view of these facts, Table II may be said to represent fairly well the distribution of the foreign born among the different nationalities.

1890. These thirty-eight cities contained 16.82 per cent of the total population of the United States in 1890. These cities were represented on the schedules by 999 employes, or 39.25 per cent of the total number of employes concerning whom reports were received from employers. This would seem to show that the force of gravity exerted by the large cities acts with more than twice the power on the class of domestic employes that it does on population as a whole. A comparison is possible here between these facts and similar ones presented by the census of 1880. In that year the fifty largest cities contained 15.53 per cent of the total population of the country, but they contained 27.91 per cent of the total number of domestic servants. The influence exerted by the large cities on domestic employes was thus at that time nearly twice that exerted on the total population. But it is seen by the Eleventh Census bulletins that the urban population has increased during the last decade more rapidly than during any previous one, and it is perhaps fair to assume that the attraction exerted by them on domestic employes has increased in the same ratio.

Some interesting facts were also ascertained in regard to wages, showing the general conformity of wages in domestic service to the principles governing wages in other industries. The following table shows the average wages received in different sections,—the general average being used in this place merely for convenience:—

TABLE III.
AVERAGE WEEKLY WAGES BY GEOGRAPHICAL SECTION.

Geographical Section.	Average Weekly Wages.	
	Men.	Women.
Pacific coast.....	\$7.57	\$4.57
Easterly section.....	8.68	3.60
Middle section.....	7.62	3.21
Western section.....	6.69	3.00
Border section.....	4.86	2.55
Southern section.....	3.95	2.22
The United States.....	\$7.18	\$3.23

The classification of sections was made with reference to conditions apparently similar as regards domestic service. The Pacific Coast included California, Colorado, Nevada, Utah, and Washington; the Eastern Section, Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont; the Middle, New York, New Jersey, and Pennsylvania; the Western, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, Ohio, South Dakota, and Wisconsin; the Border, District of Columbia, Kentucky, Maryland, Tennessee, and Virginia; the Southern, Alabama, Florida, Louisiana, Mississippi, North Carolina, South Carolina, and Texas. The differences in wages noted in Table III apparently conform to the general variation in wages in the different sections as indicated by the Fourth Annual Report of the Commissioner of Labor,¹ and also by an examination of a considerable number of reports of state bureaus of labor. The slight exception in the case of the wages of men on the Pacific coast is accidental, and due undoubtedly to the comparatively small number of returns received.

It was also found that in domestic service, as in other occupations, skilled labor commands higher wages than unskilled labor. This will be evident from the following table based on the schedules received from employers and employes and the returns from a Boston employment bureau.

In every instance it is seen that it is the skilled laborer — the cook — who commands the highest wages. The general servant who is expected to unite in herself all the functions of all the other employes named in the list becomes, on account of this fact, an unskilled workman, and, therefore, receives the lowest wages. The same principle holds true in the case of the seamstress and the laundress, the gardener and the choreman. It is difficult to make a deduction in the case of men employed in household service since no universal custom prevails, as with women employes, in regard to adding to the wages paid in money, board, lodging, and other personal expenses.

¹ P. 68.

TABLE IV.
AVERAGE WEEKLY AND DAILY WAGES BY OCCUPATIONS.

Occupation.	Weekly Wages.		
	General Schedule of		Boston Employment Bureau.
	Employer.	Employee.	
WOMEN.			
Cook.....	\$3.80	\$3.64	\$4.45
Parlor maid.....	.....	.....	3.94
Cook and laundress.....	3.50	3.27	.....
Chambermaid.....	3.31	3.47	3.86
Waitress.....	3.23	3.15	3.76
Second girl.....	3.04	3.27	3.34
Chambermaid and waitress..	2.99	3.21	.....
General servant.....	2.94	2.88	3.16
MEN.			
Coachman.....	7.84	.....	.....
Coachman and gardener.....	6.54	.....	.....
Butler.....	6.11	.....	.....
Cook.....	6.08	.....	.....
	Daily Wages.		
WOMEN.			
Seamstress.....	\$1.01	.....	.....
Laundress.....	.82	.....	.....
MEN.			
Gardener.....	1.33	.....	.....
Choreman.....	.87	.....	.....

It also seems to be true in domestic service as elsewhere that the skilled laborer does his work better than the unskilled workman. The question was asked of employers, "What is the nature of the service rendered? Is it 'excellent,' 'good,' 'fair,' or 'poor?'" The replies show that, in proportion to the number of answers, the largest percentage of service characterized as "excellent" is rendered by cooks, while the largest percentage characterized as "poor" is given by general servants. These are, it is true, matters of opinion and without a fixed standard, which it is impossible to secure; such judgments can have no absolute value. But the fact is of interest as showing the opinion of a large number of house-

keepers. The following table will show the results in regard to these two classes of employes:—

TABLE V.
NATURE OF SERVICE RENDERED.

Occupation.	Total Number of Replies.	Not Answered.	Kind of Service Rendered.							
			Excellent.		Good.		Fair.		Poor.	
			Number.	Per Cent.	Number.	Per Cent.	Number.	Per Cent.	Number.	Per Cent.
Cooks.....	262	30	83	32	113	43	58	22	8	3
General servants....	585	53	151	26	221	38	177	30	36	6

It was also found that the wages of men engaged in domestic service are higher than the wages of women. This will be seen by reference to Table III and Table IV. Two things, however, must be borne in mind: first, that nearly all the men classified as cooks are employed on the Pacific coast where wages are relatively high; second, that 40 per cent of men in domestic service do not receive board and lodging in addition to cash wages, while only two per cent of women so employed, principally colored women and laundresses, do not receive board and lodging. But, although these facts modify the discrepancy between the wages of men and women, they do not wholly remove it. Whether the difference is as great as in other occupations cannot be stated.

There was also found a slight tendency towards an increase in wages paid by employers, as is seen by this table:—

TABLE VI.
COMPARISON OF WAGES PAID.

Wages Paid.	Number.			Percentage.		
	Men.	Women.	Total.	Men.	Women.	Total.
Same as last year.....	414	1,638	2,052	87.72	79.02	80.63
More than last year.....	54	368	422	11.44	17.75	16.58
Less than last year.....	4	67	71	.84	3.23	2.79

Much has been said in regard to the immobility of labor as an obstacle in the way of the industrial advancement of women. It was found by the schedules, however, that this obstacle does not exist in domestic service in respect either to immobility of place or to immobility of occupation. It has been seen that the number of foreign born domestics form 47 per cent of the entire number as reported by employers, and 55 per cent as reported by employes. It was also found that of the native born employes 27 per cent did not reside in the same state in which they were born. More than two-thirds, therefore, of all employes concerning whom the facts were stated did not reside in the country or state in which they were born. Moreover, this statement is below the truth as it does not take into account the number of changes made within a single state, and considers only one change from place of birth to present residence. An illustration of this latter point is seen in the case of one employe who was born in Ireland, engaged in service in New York, removed to Chicago with her employer and afterwards drifted to Minnesota, where the report was made. The mobility as to employment was found to be nearly as great. Twenty-eight per cent of employes reported that they had been engaged in other occupations, while 50 per cent expressed a readiness to go into some other employment provided it would pay them as well as domestic service. It is of interest to note some of these occupations from which women have gone to domestic service. The list includes apparently nearly every form of work in every kind of mill and factory, farm work, cigar-making, sewing, dress-making, millinery, tailoring, crocheting, lace-making, carpet making, copying, places as cash-girls, sales-women, nurses, post-office clerks, compositors, office-attendants; six had been teachers; others, ladies' companions, governesses, and matrons. It is of interest also to note that the per cent of native born women who have been engaged in other occupations is slightly higher than the per cent of foreign born,— thirty-one to twenty-five.

If a comparison is made between these facts and those

presented in the Fourth Annual Report of the Commissioner of Labor on Working Women in Large Cities, it will be found that the mobility of place is less among working women of the class represented by the Report than among domestic employes. This is due largely to the fact that foreign born women enter domestic service in greater numbers than they do other occupations. The Report shows that of the native born women 20 per cent do not reside in the state in which they were born.¹ The Report also shows that 45 per cent of the women represented had been engaged in some previous occupation.² Domestic service thus does not differ materially in point of mobility from other occupations in which women are engaged, if the factor of foreign birth is eliminated. Employers have come to believe that more stability rather than more mobility should be encouraged in this occupation.

These general reasons and specific illustrations have been given in order to show that while the returns received through the schedules can in no sense be considered an exhaustive presentation of the subject of domestic service, or even of a single phase of it, they may be used to indicate fairly well certain present conditions and tendencies.

Some of these conditions and tendencies have been suggested in the facts already given. Other industrial conditions may be shown through other tables.

One of the most striking conditions of the service, especially in view of the unwillingness of many persons to enter it, is the fact that the wages received are relatively and sometimes absolutely higher than the average wages received in other wage-earning occupations open to women. This has been suggested by previous tables, but will be more evident from the following detailed tables:—

¹ P. 249. ² P. 325.

Occupations.
Schedule of Employers.

Under \$1.

WOMEN.

General servants.....	1
Second girls.....	
Cooks and laundresses.....	
Cooks.....	4
Chambermaids and waitresses.....	2
Chambermaids.....	1
Waitresses.....	
Nurses.....	1
Housekeepers.....	
Total.....	9

MEN.

Butlers.....	
Coachmen and gardeners.....	
Coachmen.....	
Cooks.....	
Total.....	

WOMEN.

Laundresses.....	123
Seamstresses.....	48
Total.....	171

MEN.

Gardeners.....	26
Choremen.....	24
Total.....	50

Schedule of Employees.

General servants.....	1
Second girls.....	
Cooks and laundresses.....	
Cooks.....	1
Chambermaids and waitresses.....	
Chambermaids.....	
Waitresses.....	
Nurses.....	
Housekeepers.....	
Total.....	2

were
of the

17] *A Statistical Inquiry Concerning Domestic Service.* 105

TABLE VIII.¹

AVERAGE WEEKLY AND DAILY WAGES BY OCCUPATIONS.

Occupation.	Person Replying.					
	Employer.			Employee.		
	Average Weekly Wages.	Per Cent Receiving More than the Average.	Per Cent Receiving the Same or Less than the Average.	Average Weekly Wages.	Per Cent Receiving More than the Average.	Per Cent Receiving the Same or Less than the Average.
WOMEN.						
General servants.....	\$2.94	52.97	47.03	\$2.88	55.87	43.13
Second girls.....	3.04	40.00	60.00	3.27	53.85	46.15
Cooks and laundresses.....	3.50	43.97	56.03	3.27	53.33	46.67
Cooks.....	3.80	45.71	54.29	3.64	43.56	56.44
Chambermaids and waitresses	2.99	58.66	41.35	3.21	52.17	47.83
Chambermaids.....	3.31	47.83	52.17	3.47	32.00	68.00
Waitresses.....	3.23	43.69	56.31	3.15	44.44	55.56
Nurses.....	3.53	36.00	64.00	3.03	33.33	66.67
Housekeepers.....	5.15	25.00	75.00	5.15	25.00	75.00
Total.....	\$3.23	47.88	52.12	\$3.11	50.95	49.05
MEN.						
Butlers.....	\$6.11	50.00	50.00	.....	.....	.....
Coachmen and gardeners.....	6.54	44.72	55.28	.....	.....	.....
Coachmen.....	7.84	46.79	53.21	.....	.....	.....
Cooks.....	6.09	47.06	52.94	.....	.....	.....
Total.....	\$6.03	46.42	53.58	.....	.....	.....
	Average Daily Wages.					
WOMEN.						
Laundresses.....	\$0.82	53.28	46.72	.....	.....	.....
Scamstresses.....	1.01	39.05	60.95	.....	.....	.....
Total.....	\$0.90	49.00	51.00	.....	.....	.....
MEN.						
Gardeners.....	\$1.33	56.56	43.44	.....	.....	.....
Choremen.....	.87	43.59	56.41	.....	.....	.....
Total.....	\$1.29	53.42	46.58	.....	.....	.....

¹ In the classification in these two tables the employes in several large boarding houses were omitted. All of those included under the term "nurses" are nurse-girls, with the exception of the few receiving the highest wages.

The following tables also show the classified and average wages paid in the principal occupations as reported by a Boston employment bureau:—

TABLE IX.
CLASSIFIED WEEKLY WAGES BY OCCUPATIONS.

Occupation.	Earning Weekly.										Total.
	\$1, but under \$2.	\$2, but under \$3.	\$3, but under \$4.	\$4, but under \$5.	\$5, but under \$6.	\$6, but under \$7.	\$7, but under \$8.	\$8, but under \$9.	\$9, but under \$10.	\$10, but under \$11.	
General servants...	8	183	577	143	3	...	...	...	...	...	914
Second girls.....	2	41	363	69	...	...	...	...	...	...	475
Cooks.....	1	3	39	347	145	28	4	3	...	4	574
Chambermaids.....	...	3	40	37	2	...	...	...	...	...	82
Waitresses.....	...	4	29	16	1	...	...	...	...	...	50
Parlor maids.....	...	...	11	45	1	...	...	...	...	...	57
Nursery maids.....	7	45	119	57	3	1	1	...	...	...	233
Laundresses.....	...	1	9	27	15	1	...	...	...	...	53
Total.....	18	280	1,187	741	170	30	5	3	...	4	2,438

TABLE X.
AVERAGE WEEKLY WAGES BY OCCUPATIONS.

Occupation.	Average Weekly Wages.	Per Cent Receiv- ing More than the Average.	Per Cent Receiv- ing the Same or Less than the Average.	Highest Wages Received.	Lowest Wages Received.	Total Number.
General servants.	\$3.16	40.5	59.5	\$5.00	\$1.50	914
Second girls.....	3.34	62.2	37.8	4.50	1.50	475
Cooks.....	4.45	50.0	50.0	10.50	1.00	574
Chambermaids...	3.86	57.4	42.6	5.00	3.00	82
Waitresses.....	3.76	48.4	51.6	5.00	2.50	50
Parlor maids.....	3.94	80.4	19.6	5.00	3.50	57
Nursery maids...	3.26	51.3	48.7	7.00	1.00	233
Laundresses.....	4.44	44.4	55.6	6.00	2.00	53
Total.....						2,438

It is seen from Table VIII that the average weekly wages in domestic service are \$3.23,—a fair average in this case, since 48 per cent receive more than the average and 52 per cent the same or less than the average. The average domestic employe, therefore, is able to earn in money during the year \$167.96,—a fair estimate, since in seventy-five cases out of every hundred the vacation granted women employes during the year is given without loss of wages. This forms, however, but a part of the annual earnings. To this sum must be added board and lodging, fuel and light. For the equivalent in quality and quantity to that furnished by the employer the employe would in general be obliged to pay for board, lodging, and other incidental expenses at a reasonable estimate five dollars per week, or \$250 annually, deducting board for two weeks' vacation. The total annual earnings of a domestic employe, therefore, amount to nearly \$420. To this the negative facts must be added that there is no expense for laundry work, and that the work involves few personal expenses in the way of clothing, and that these necessary expenses are often partially met through gifts from the employer. Again, the position entails no expenditures for car fares in going to and from work, or other demands made in a business way by other occupations, and it involves no outlay for appliances for work as a sewing machine, typewriter, text-books, etc. Moreover, no investment of capital is necessary in learning the principles of the work, since employers have thus far been willing to make of their own homes training-schools for employes. The domestic employe is therefore never obliged to pay back either the capital invested in preparing for her work or the interest on that amount. It thus seems possible for the average household employe to save annually nearly \$150 in an occupation involving no outlay or investment of capital in any way, and few or no personal expenses.

A comparison may be made between these wages and the annual salaries received in sixteen representative cities by

the women teachers in the public schools. The following tables show the annual classified and average salaries received¹:—

TABLE XI.
CLASSIFIED ANNUAL SALARIES OF WOMEN TEACHERS.

City.	EARNING ANNUALLY.											Total.
	Under \$300.	\$300, but under \$400.	\$400, but under \$500.	\$500, but under \$600.	\$600, but under \$700.	\$700, but under \$800.	\$800, but under \$900.	\$900, but under \$1,000.	\$1,000, but under \$1,200.	\$1,200, but under \$1,500.	More than \$1,500.	
Albany, N. Y.....	1	26	34	153	22	11	6	....	....	1	....	254
Atlanta, Ga.....	7	1	32	31	3	4	1	....	....	2	....	81
Baltimore, Md.....	....	....	628	246	101	1	1	40	3	....	....	1,020
Cambridge, Mass.....	....	1	22	19	146	10	3	11	2	....	....	214
Cincinnati, Ohio.....	....	....	26	50	59	359	98	1	5	19	2	619
Cleveland, Ohio.....	....	....	119	124	269	89	16	8	14	10	4	653
Detroit, Mich.....	....	54	63	111	20	121	35	5	3	14	1	427
Lawrence, Mass.....	....	....	43	49	6	....	2	1	1	1	....	103
Lowell, Mass.....	....	....	8	5	155	9	1	....	....	1	1	180
Milwaukee, Wis.....	....	2	76	72	197	19	7	15	9	2	....	399
New Haven, Conn.....	....	54	73	38	107	14	11	....	1	2	1	301
New Orleans, La.....	2	172	174	3	18	7	....	5	1	....	....	382
Paterson, N. J.....	....	55	97	26	8	9	2	....	....	....	....	197
Rochester, N. Y.....	45	57	287	3	7	14	6	....	1	2	....	422
St. Louis, Mo.....	61	36	182	362	122	133	42	20	12	13	13	996
Syracuse, N. Y.....	....	35	52	139	21	3	13	1	....	....	....	264
Total.....	116	493	1,916	1,431	1,261	803	244	107	52	67	22	6,512

The concentration of salaries is seen to be on those between \$400 and \$500, the average salary being \$545. This sum represents the full amount of wages received. To ascertain the amount it is possible to save annually there must be deducted at least \$260 for board and lodging, and \$25 for laundry expenses, leaving a cash balance of \$260. Out of this sum, however, must come other necessary expenses, as

¹ The figures are taken from the annual reports of city superintendents. The attempt was made to find the average salaries in the fifty largest cities, but many cities do not publish in detail the salaries paid. The reports used were those for the year ending in 1889,—the year for which reports were made through the schedules,—with the exception of Paterson where the report for 1890 was used. Half-day teachers are omitted as far as known. In cities having separate schools for colored and white children, the teachers in colored schools are included where the salaries paid are the same as those paid in white schools of the same grade,—otherwise they are omitted.

TABLE XII.
AVERAGE ANNUAL SALARIES OF WOMEN TEACHERS.

City.	Average Salary.	Per Cent Receiving More than the Average.	Per Cent Receiving the Same or Less than the Average.
Albany, N. Y.....	\$505.73	27.70	72.30
Atlanta, Ga.....	459.05	48.12	51.88
Baltimore, Md.....	500.92	37.12	62.88
Cambridge, Mass.....	628.35	22.32	77.68
Cincinnati, Ohio.....	702.87	20.60	79.40
Cleveland, Ohio.....	625.60	43.20	56.80
Detroit, Mich.....	607.96	96.02	3.98
Lawrence, Mass.....	511.16	26.22	73.78
Lowell, Mass.....	608.66	6.71	93.29
Milwaukee, Wis.....	588.00	63.50	34.41
New Haven, Conn.....	536.41	52.96	47.04
New Orleans, La.....	423.78	28.08	71.92
Paterson, N. J.....	455.20	22.84	77.16
Rochester, N. Y.....	431.63	57.34	42.66
St. Louis, Mo.....	574.68	34.89	65.11
Syracuse, N. Y.....	494.98	67.04	32.96

the outfit for work, as books, stationery, etc., travelling expenses, car fares, society fees, etc., and a large item for clothing.* There should also be deducted the interest on the capital invested in securing the education demanded in preparation for the work. If all of these items are considered, and the greater social demands entailed by the position, it seems possible for the average domestic employe to save at least as much money as the average teacher in the city schools. This comparison is probably relatively higher in favor of the teacher than it should be, since in the average wages for domestic employes are included the wages received in agricultural districts where wages are lower than in cities. It is also a comparison between skilled workers on the one hand, and on the other hand an occupation in some of the subdivisions of which the laborers are unskilled.

It has, unfortunately, not been possible to compare the wages received in the same city by teachers and domestic employes. A comparison, however, can be made between the wages received in Boston for domestic service and by the

teachers in the public schools in the neighboring city of Cambridge.

The average wages received by a cook in a private family in Boston are, as has been seen by Table X, \$4.45. This judgment is based on 574 returns, and is an exact average, since 50 per cent receive more than that amount, and 50 per cent the same or less than that. She therefore earns annually \$231.40 plus \$275 for board, lodging, fuel, light, and laundry expenses, or \$506.40.

Fifty-six per cent of the teachers in the city schools in Cambridge earn annually \$620, or, deducting \$285 for board, etc., for fifty-two weeks, \$335 in money. This is \$103 more than is received by the Boston cook, but out of this must come numerous expenses entailed by the position from which the domestic employe is exempt. The cash annual savings in the two cases cannot vary materially.

It will also be seen by reference to Tables X and XII that the Boston cook earns absolutely more than does the average city teacher in Albany, Atlanta, Baltimore, New Orleans, Paterson, Rochester, and Syracuse.

A second comparison is suggested by the investigations conducted by the Department of Labor. Through these it was found that the average annual earnings of the working-women in twenty two typical cities are \$272.45.¹ This average takes into consideration time lost,—a factor which does not enter into domestic employments except in a casual way. The annual earnings, therefore, of the class of women represented by the report are much less than those of the domestic employe. The same point is also illustrated by a comparison of the amounts saved in the two occupations. In eleven cities investigated by the Department of Labor the average amount saved was less than \$50; in nine cities it was \$50, but under \$100, while in only two cities was it more than \$100, the highest average amount being \$111.² The highest of these

¹ *Fourth Annual Report*, pp. 520-529.

² *Ibid.*, p. 626.

averages is small in comparison with the amount it is possible to save in domestic service, as has been suggested.

No question in regard to earnings saved was asked on the schedule sent to employes, but many statements on this point were voluntarily made by employes. One writes, "I have put \$100 in the savings-bank in a year and a half. I had at first \$10 a month, but now I have \$12." Another states, "I can save more in domestic service than in any other kind of work." A third says, "My expenses are less than in any other work." An employe who receives \$35 per month states, "I choose housework in preference to any other principally because for that I receive better pay. The average pay for store and factory girls is eight and nine dollars a week. After paying for board and room-rent, washing, etc., very little is left, and what is left must be spent for dress,—nothing saved."

The question as to comparative amounts saved has also been asked the cashiers of banks in small cities and towns where factories are found, and the personnel of depositors is known by the officials of the banks. No records are of course kept, but the opinion has been several times expressed that the factory employes are not as saving, as a class, as are domestic servants. In one place where about 2000 factory employes are found, it was stated that no woman employe had a sum to her credit as large as had been deposited by a domestic.

The conclusion seems to follow that high wages are not the only determining factor in the choice of an occupation.

Another interesting fact in regard to wages is shown through Tables VII and IX, that while the wages paid in domestic service are on the average high, the occupation offers few opportunities for advancement in this direction. The tables show but five instances, with the exception of nurses,¹ where the weekly cash wages reach \$10 per week, and only

¹ The returns for this class are somewhat confused, information being given in some instances in regard to trained nurses, and in others, the majority of cases, concerning nursery maids.

seven others where they rise above \$8 per week. In the two occupations, the wages in which have been compared with those in domestic service, while the general average wages are low, it is possible to reach through promotion a comparatively high point. The fact that the plain of average wage in domestic service is a high one is an inducement for women of ordinary ability to enter the occupation. On the other hand, the fact that the wage limit is soon reached, must act as a barrier in the case of many who are specially ambitious.

It has been stated that wages received in domestic service are not affected by the vacation granted during the year, since in the majority of cases no deduction in wages is made where a short vacation is given. The following tables illustrate this:—

TABLE XIII. VACATION GRANTED DURING THE YEAR.

Reported by Employees.	Women.		Men.	
	Number.	Per Cent.	Number.	Per Cent.
Total number of employees.....	2,073	....	472	....
Not reported.....	898	....	267	....
Not applicable (laundresses, etc.).....	203	....	50	....
Reported and applicable.....	972	....	155	....
Vacation granted.....	971	....	153	....
Time not specified.....	202	20.78	34	21.94
Less than one week.....	127	13.07	42	27.10
One week.....	150	15.43	18	11.61
More than one week, less than two.....	25	2.57	5	3.22
Two weeks.....	210	21.61	33	21.29
More than two weeks.....	257	26.44	21	13.55
No vacation.....	1	.10	2	1.29

TABLE XIV. VACATION GRANTED WITH OR WITHOUT LOSS OF WAGES.

Reported by Employers.	Women.		Men.	
	Number.	Per Cent.	Number.	Per Cent.
With loss of wages.....	210	21.63	20	13.07
Without loss of wages.....	723	74.46	133	86.93
Half wages.....	37	3.81	....	....
Cost of board added.....	1	.10	....	....
Total.....	971		153	

A short vacation granted during the year without loss of wages has in many localities come to be regarded by employes as one of the prerogatives of the occupation, and not, as formerly, a special privilege given. All things considered, it is a matter of surprise that so much rather than that so little time is given. In other occupations a vacation can be granted employes during a dull season without loss to the employer. But the household machinery cannot stop action without disaster. A vacation to household employes means that the employer must perform a double amount of domestic work, or provide for special assistance,— often a difficult and even impossible task.

It is also true that employers, as a rule, grant employes a certain amount of free time each week. Reports were given on this point in regard to 1672 employes, and in only 48 cases was this privilege not granted. But apparently no uniform custom prevails in regard to the specific time in the week thus given. It was found that different employers had made 123 classes of combinations of the seven afternoons and seven evenings of the week, thus disproving the common belief that the custom is universal of granting Thursday afternoon and Sunday evening. In 68 of the classes mentioned, one or more afternoons are included, and in 15 others some portion of Sunday. In the case of more than a thousand employes, at least one afternoon each week is given, while more than four hundred employers give a part of Sunday.

The statement has been made that in only a limited number of instances is board not included in the wages paid women employes. The following list shows the only instances reported of both women and men employes:—

Second girls,	2	Butlers,	1
Cooks and laundresses,	1	Coachmen and gardeners,	52
Laundresses,	39	Coachmen,	45
Chambermaids and waitresses,	1	Gardeners,	76
Chambermaids,	1	Choremens,	12
Waitresses,	1		

In addition to board, which is considered a part of the wages paid, and annual vacation without loss of wages and free time each week, which are considered prerogatives of the place rather than special privileges, many employers grant special favors not of necessity implied in the engagement made with employes. To the question asked employers, "Do you grant any special privileges?" 30 answered "No," and 175 give no answer; 800 enumerated special privileges, and these formed 68 different classes. The most important of these were single rooms, medical care and attendance when sick, use of daily papers, books and magazines, evening instruction, sitting-room for visitors, no restriction as to visitors; use of bath-room, sewing-machine, and horse and carriage when distant from church, seat in church and at table, except when guests were present. Many other privileges are mentioned, but these are the ones most frequently granted. 70 per cent of employers state that they furnish each employe a single room; but one-half of this number employ only one domestic. In many cases a large room is given for every two domestics, with separate furniture for each. 146 employers specify the use of the dining-room, and 94 families give the use of a special sitting-room. All of these favors shown indicate that, with the single exception of a seat at the family table, the domestic is as much a part of the family she serves as is the average boarder of the household in which he resides.

The attempt was made to ascertain the actual working hours in domestic service. No complaint is more often made than of irregularity in this particular, and the results as given below seem to justify the judgment.

The table represents, moreover, only the general irregularities in working hours. The question is complicated by the industrial and social conditions in every household. Ten hours may represent in one family the average daily working hours, but the actual working hours may be for five consecutive days eight, nine, ten, eleven, and twelve. It is the irregularity in the distribution of working time rather than the

TABLE XV.
ACTUAL DAILY WORKING HOURS.

Occupation.	Number Working					Not Answered.	Total.	Per Cent Working				
	10 Hours.	11 Hours.	12 Hours.	Less than 10 Hours.	More than 12 Hours.			10 Hours.	11 Hours.	12 Hours.	Less than 10 Hours.	More than 12 Hours.
WOMEN.												
General servants.	149	28	91	142	45	183	638	32.75	6.15	20.00	31.21	9.89
Second girls.	29	6	26	40	21	52	174	23.77	4.92	21.31	32.79	17.21
Cooks and laundresses.	25	7	21	21	26	42	142	25.00	7.00	21.00	21.00	26.00
Cooks.	58	9	41	45	43	92	288	29.59	4.50	20.92	22.97	21.94
Laundresses.	94	11	16	36	3	91	251	58.75	6.88	10.00	22.50	1.87
Chambermaids, waitresses	34	4	20	21	20	36	135	34.34	4.04	20.20	21.21	20.20
Chambermaids.	23	3	10	17	6	37	96	38.98	5.09	16.95	28.81	10.17
Waitresses.	46	3	2	7	10	39	107	67.65	4.41	2.94	10.29	14.71
Nurses.	25	8	25	8	19	45	130	29.41	9.41	29.41	9.41	22.35
Seamstresses.	57	2	4	26	....	18	107	64.04	2.25	4.50	29.21	....
Housekeepers. ....	....	....	....	1	....	4	5	....	....	....	....	....
Total.	540	81	256	364	193	639	2,073	37.66	5.65	17.86	25.38	13.45
MEN.												
Butlers.	11	....	10	5	7	13	46	33.34	....	30.30	15.15	21.21
Coachmen and gardeners	31	8	26	20	10	35	130	32.63	8.42	27.37	21.05	10.53
Coachmen.	27	4	18	5	10	48	112	42.19	6.25	28.13	7.81	15.62
Gardeners.	52	6	12	23	8	25	126	51.49	5.94	11.88	22.77	7.92
Choremnen.	7	1	2	11	3	17	41	29.17	4.17	8.33	45.83	12.50
Cooks.	7	....	3	3	1	3	17	50.00	....	21.43	21.43	7.14
Total.	135	19	71	67	39	....	472	40.79	5.74	21.45	20.24	11.78

Per Cent Working	Women.	Men.
ten hours.....	37.66	40.79
less than ten hours.....	25.38	20.24
more than ten hours.....	36.96	38.97

amount of time demanded that causes dissatisfaction on the part of employes. It is difficult to see how this objection to domestic service can ever be wholly overcome, although undoubtedly the irregularities in many households could be somewhat lessened were the subject carefully considered. "You are mistress of no time of your own," writes one em-

ploye; "other occupations have well defined hours after which one can do as she pleases without asking anyone."

The question was asked of employes: "What reasons can you give why more women do not choose housework as a regular employment?" The reasons assigned may be classified as follows:—

Pride, social condition, and unwillingness to be called servants.	157	Girls are too lazy,	8
Confinement evenings and Sundays,	75	Health considerations,	8
More independence in other occupations,	60	Girls are too restless,	6
Too hard and confining,	42	Too few privileges,	6
Other work pays better,	42	Hard work, little pay,	5
Lack of consideration by mistresses,	38	Other occupations easier,	4
Hours too long,	38	Different tastes,	4
Do not like housework,	19	Bad character of some, reflects on others,	3
Do not know how to do housework,	12	Receive no encouragement,	3
Can live at home by working in shops,	11	Too lonely and meals alone,	3
		Constant change in work,	3
		Shop work cleaner,	2
		No chance for promotion,	2
		Miscellaneous reasons, one each	11
		Total,	562

Only one of the reasons given above, "lack of consideration by mistresses," concerns the personal relationship existing between employer and employe, and only 38 persons out of 562, or 7 per cent of the entire number, assign this as an objection to domestic service. The reasons that apparently weigh most heavily against domestic service as an occupation are the industrial and social conditions under which it is performed. The conclusion must follow that any attempt to improve domestic service by bringing about merely better personal relations between mistress and maid must fall far short of reaching the end desired. No improvement is possible which is not based on a thorough study of the actual, not theoretical, objections to the employment as they exist in the minds of employes in comparison with the objections found to other occupations.

The question was asked of employers: "What explanation of the difficulty (of securing good domestic servants) can you give?" The replies may be classed as follows¹:—

Fault of employes,	432
Economic reasons,	408
Fault of employers,	218
Social reasons,	121
No difficulty exists,	45
Total,	1224

The question was also asked of employers: "How do you think the difficulty could be lessened or removed?" These replies may be thus classed:—

Applying the Golden Rule,	277
Training schools for servants,	242
Better supervision,	138
Elevating domestic service,	99
Better gradation of wages,	91
Co-operation,	61
Better business relations between mistress and maid,	49
Withholding recommendations from incompetent help,	39
Teaching housework in the public schools,	25
Different kinds of immigration,	20
Service books as in Germany,	12
Simpler mode of living,	12
Miscellaneous reasons,	25
	1090

It is not the object of this paper to discuss the reasons given by employers in explanation of existing difficulties or the remedies proposed by them. It must suffice to call attention to the discrepancies between the reasons urged by employes against domestic service as an occupation, and the remedies proposed by employers for removing the difficulties they have observed. The belief is sometimes forced upon

¹ One other class of replies received ought to be noted. One of the clerks who assisted in the tabulation reported one morning, "I find eighteen long answers containing no information." The difficulty experienced in the tabulation is undoubtedly sometimes found in the household,—long directions given by the employer, hopeless confusion in the minds of others as to what is really desired.

one that in no other occupation have so many and such varied measures of relief been proposed after so slight a diagnosis of the case.

The investigation of this subject and the discussion of the results obtained by means of it have not been considered a final settlement of the perplexing questions connected with domestic service. It is not believed that all, or even one of these questions can be settled as a result of it. But the investigation has been made as a special plea for a more scientific study of the subject on the part of the general public than it has yet received, for a recognition of its place in the industrial field on the part of statisticians and economic specialists. It is an ambitious hope that in time the great labor bureaus, always ready to anticipate any demand of the public for a scientific investigation of labor questions, will recognize a demand for work in this direction, and thus present far more satisfactory material to be used as a basis for subsequent discussion than has been possible through the work of an individual student.

THE THEORY AND PRACTICE OF PRICE
STATISTICS.

BY ROLAND P. FALKNER, PH.D.

There has often been noted in the development of statistical science a wide divergence between the theoretical, professorial treatment of the subject and the views of practical statisticians. This divergence has been frequently a direct conflict of opinion. At other times it has seemed rather that the connection between the work of the theorist and the practical man has been wanting. The latter has drawn no principles of action from the doctrines of theoretical writers, and he has been loath to believe that the cause of statistics has been strengthened by them. He knows full well that the general public for whom his labors are primarily intended has no knowledge of these speculations nor interest in them. In consequence of this fact theory and practice have developed side by side, and any reflex action which one may have exerted upon the other has proceeded almost exclusively from practice, and very little from theory. The explanation of this fact may be due to the circumstance that what has frequently been called theory is not in any sense distinct from practice, but merely a refinement of the precepts of experience. If, however, there is any distinct theory of statistics, it should accord not only with the practice of working statisticians, but should indicate clearly and distinctly the general lines along which all successful statistical effort should be conducted. In his *History, Theory and Technique of Statistics*,* Prof. Meitzen believes that he has made a general statement of statistical theory applicable to all forms of statistical investigation. Since Prof. Meitzen is of the opinion

* Translated by the present writer and published by the American Academy of Political and Social Science, 1891.

that the essence of statistical science is its method, it will readily be seen that such a general statement is not beyond the range of possibility.

The treatise of Prof. Meitzen is of rather an abstract character, and illustrations do not figure prominently upon his pages. It seems to have been his effort to state his general views in the most condensed form, and to leave the application of them to the reader. It is the object of the present discussion to consider the subject of price statistics in the light of Prof. Meitzen's theory. The effort will be made to show how according to the theory price statistics would be collected, and how the practice accords or disagrees with theoretical percepts. We shall then examine whether the rules drawn from the theoretical consideration of statistical methods will be of service in the use of price statistics.

Statistics is the investigation of aggregates by the enumeration of their component elements, and the comparison of the results. These two steps are clearly marked out. Through the enumeration of the elements we arrive at a knowledge of the aggregate in question. We ascertain that it contains a certain number of units of a given description. The larger the number of units enumerated in the same aggregate the more accurate is our knowledge of it. The groundwork of all statistical effort is such enumeration, and the theoretical rules which apply to unit and aggregate, which must be observed to maintain the integrity of the result, are of universal validity. But the knowledge of the aggregate is unrelated, and obtains its real significance when we compare it with other aggregates of the same general character. This second step of comparison is of no less importance than the first, and intimately related to it.

In every statistical inquiry there are these two steps,—enumeration and comparison, in some cases clearly defined, in others less obvious. We shall consider in turn with especial reference to prices the principles of enumeration and those of comparison. The principles of enumeration above outlined

are sufficiently familiar in their application. In statistics of population we discover sex, age, education, and a host of other characteristics in their numerical distribution in a given population. By increasing the number of characteristics we increase our knowledge of the object of our investigation, the population of a given region. It is clear that when our enumeration is complete our result stands in the form x males and y females in a population, which is typical of all the results.

While nothing could be clearer than the applicability of these principles to population statistics, it cannot be denied that when other branches of statistical inquiry are considered the force of these propositions is not so obvious. In the whole field of economic statistics their significance is not apparent at first glance. In population statistics the elements of aggregate and unit are sharply outlined. Not so in economic statistics. So distinct seem the problems of these two fields of inquiry that it does not appear probable that one could be of benefit to the other. It is not surprising that, historically, they developed independently. If, however, there is any unity in statistical inquiry, what is true of one field of research must apply equally well to the other. If any general formulation of statistical theory is to be considered valid, it must be quite as fruitful in the one field as in the other. Our present concern is to discover if possible in price statistics the analogy with the processes of enumeration here discussed. In the statistics of prices the form of statement is quite different from that customary in the statistics of population, and it would appear that the elements of aggregate and unit were not present. These statistics deal largely in averages, while in population statistics the average is little used.

To suppose price statistics collected in the same way as population statistics, we may consider the aggregate as the total sales of a given class in a given area and period of time. In this case the unit of enumeration would be a certain quantity of the thing sold. The problem would be to discover the exact quantities, in other words, how many units

were sold at each price which may have occurred during the period. The result would be a statement that, of all the goods sold, such a quantity or proportion was sold at the price x , so many at y , etc. Such a form of price statistics might under certain circumstances be very useful. According to statistical theory it is the normal form, and hence incidentally the test of the forms in common use.

The normal form of price statistics is not found in practice. In all branches of economic statistics its use is rare. Yet it needs but little consideration to convince us that it is the normal form. A striking analogy is furnished in the statistics of wages. It has been common to state wages as average wages, but the serious drawbacks to such a statement have led to the more explicit form of classified wages.* This classified wage statement approaches very closely the normal form, which is the first result of statistical enumeration. A further illustration of the use of the normal form in economic statistics may be seen in the statement of the rates of interest on mortgages brought out in the investigation which is being conducted by the Eleventh Census.† The writer has used the classified form in treating of the capital of corporations.‡ Instances need not be multiplied to show that what statistical theory would call the normal form is quite as applicable to certain economic statistics as to those of population.

Statistical theory requires its application to the statistics of prices, but the great difficulty of the case and the comparative value of results obtained by more summary processes have led to the substitution of the latter in many instances for the exact enumeration. In dealing with prices, the aim of the investigation is to obtain as concise a statement as possible of price at a given time and at a given place. This takes the form of the average. From any detailed statistical statement, as for instance the wages of workingmen, or the

* See *Evolution of Wage Statistics* by Carroll D. Wright, *Quarterly Journal of Economics*, Vol. VI, p. 151 (January, 1892).

† See *A Plea for the Average*, George K. Holmes, Vol. II of these Publications, p. 421.

‡ *Statistics of Private Corporations*, Vol. II of these Publications, p. 50.

ages of the population, we can form an average. Such an average is not theoretically distinct from an average price, but the latter may be of great value and the former comparatively worthless. In other words, the end and aim of all statistical work is to find a concise expression for a group of facts. The facts may be so constituted that the most valuable statement is an average, or they may be such that another form of statement is more expressive.*

In the illustration noted above, the age of the population, the deviation on either side of the average is so great the possible groupings of the facts so numerous, that the average does not give us any very definite information. In a less degree the same applies to wages, and while, therefore, the average may suit certain purposes it does not satisfy the entire range of statistical problems touching wages. As a rule, the reverse is the case in the statistics of prices. Here the general tendency is vastly more important than the deviations from it which in the main are insignificant. The forces which work towards uniformity of price are so much stronger than those which act in the opposite direction that little time need as a rule be spent in the study of the latter. Hence, the aim of price statistics is the average price.

The average age of the population derived from the individual ages of all the members must be a true average. If price statistics should be collected in such a way that we knew the exact quantities sold at each price, we could obtain a true average price. But this is in the rarest cases possible. It is claimed that the price reports of some commercial bodies are constructed on this plan. Where the commerce in any commodity centres in an exchange of any character, it is evident that such process involves but little difficulty. Where this is not the case the difficulty of obtaining exact reports on the amount of sales is so great that it is not attempted.

* Statistical nomenclature is somewhat at sea on the subject of the average. In this paper average means, with Venn, a single artificial value, substituted for a group of actual, concrete values. His use of the term "mean" for arithmetical average seems confusing, and in this paper that idea is expressed by true average. See Venn, *On the Nature and Uses of Averages*, *Journal of the Royal Statistical Society*, Vol. LIV, Sept., 1891, p. 429.

Theoretical statistics requires the true average. But the true average rests upon an actual enumeration which is almost if not quite impossible. We now enter the field of statistical practice, and here we find various methods of ascertaining average price, which, in theoretical language, are substitutes for enumeration. It becomes our duty to subject these substitutes to the test of theory. This discussion does not purpose to be exhaustive, but to include the more prominent substitutes. The substitutes for the true average which claim our attention are what may be termed the "average of experience," the average of rates, the mean between highest and lowest price, and the representative price.

What I have termed the average of experience is the opinion of persons supposed to be perfectly familiar with the conditions of commerce of the article whose price is quoted. Upon such expert opinion we are forced to rely very largely in the price quotations of trade journals, which form the bulk of recorded prices. Such journals frequently publish prices as highest and lowest, but a single average quotation is not infrequent. How the figure is obtained can, as a rule, only be surmised. It seems probable, however, that the process of obtaining a true average is followed if only in a crude way. The expert knows that large sales have been made at various prices. He will select the price at which sales have been largest, and then consider whether the sales made at other prices have been of importance enough to warrant a deduction from or increase of the most frequent price in making his quotation. In so doing he rounds off his results for convenience sake. The true price average would in many cases be an indefinite number of decimals, but practical considerations hold the expert to certain familiar fractions of cents, or in articles of considerable value of dollars. Quotations of this character, while they do not lay claim to absolute accuracy, still attain in many cases a high degree of precision. They have the confidence of the commercial world, and wide-reaching business enterprises are founded upon them. Scien-

tific statisticians may be disinclined to use figures the accuracy of which cannot be tested, since their origin cannot be traced. But any statistics not founded on actual enumeration are impossible unless confidence be placed in the judgment of those who furnish the original data.

The average of rates is a simple expedient of finding the actual different prices at which the goods in question have been sold, and taking their average irrespective of the quantities sold at each particular rate. Such a process is clear and open, but a question may be raised as to its value. It proceeds on the assumption that the amount of goods sold at each rate is substantially the same. Such an assumption may or may not hit the facts very squarely, but it underlies, as will be seen later, a very considerable part of the work done in the statistics of prices. If the range of variation be not great an average of rates will approach quite closely a true average, and under normal conditions of trade this will be the case.

The mean between highest and lowest price is frequently employed as an average price. It is, perhaps, the least satisfactory of all. If no unusual factors determine the extremes, it is evident that a point midway between the two extremes must come very close to the true average if we can assume a fairly equal distribution of sales at the various intervening rates. As compared with the average of rates this method is inferior, since, besides the assumption of equal distribution of sales which both have in common, this method suffers from the difficulty of an accurate determination of the extremes. While in a concentrated market the difficulty is less, in a diffused commerce it is quite considerable. There are sales which take place under unusual circumstances which are very apt to affect the extremes of price. The question whether these are to be considered commercial sales, and, therefore, the extremes of price, is one that the collector of information must decide, and reliance must be had in his judgment. It should be noted that in the average of rates the inclusion of

these extreme prices will affect the result, though not in so marked a degree as when the result depends upon the extremes only.*

In the three substitutes for the true average thus far considered we deal with an artificial construction in many respects less satisfactory than the true average. But there are some who object to any average, who desire actual concrete facts. It must, however, be evident that we cannot express a group of facts in a single expression which shall be typical of the whole unless it be an average or approach the average in its nature. If we compare a composite photograph which has some analogies to a statistical average with the photographs of the persons who compose it, we will surely find a head which differs less than the others from the type revealed by the composite picture. This head may then be taken as a representative of the type. If there were any means by which this representative could be found without the tedious process here indicated, it would be a great gain. Something parallel to this is done in those statistics of prices which place the representative price in lieu of the average. The laws of trade are so well known that if, instead of pursuing any of the courses here marked, we choose a place where the normal conditions of competition are present, and a normal trade carried on, the specific price in that place or that establishment must approach very closely the average. In this method we secure a result that is purely concrete. It is taken from actual sales. It can be used for statistical purposes because it typifies the true average, and is probably as near an approach to it as can be secured, provided always that insight and judgment have been used in the selection of the establishment. Here again reliance must be placed upon the good faith and the ability of those who collect the figures.

Each of the four substitutes for the true average has its

* An illustration of this form of price statistics is found in the statistics published each year as an appendix to the *Zeitschrift des königl. preuss. Statistischen Bureau*. They give the prices of certain commodities in 165 markets in Prussia, arranged as highest, lowest, and mean price.

justification. Each abbreviates the statistical method of enumeration. Each requires us to have confidence in the ability and fidelity of those charged with the work. There are practically no price statistics collected by the normal statistical method. It would be an impossibility except in rare cases and restricted areas. In all price statistics we are, therefore, dealing with what Meitzen calls estimates.

The substitutes which we have discussed have their justification in their approach to the average. They can, therefore, be used only when the purpose of the investigation is to ascertain an average price. As has been said, this is the usual aim of inquiries into the statistics of prices, but there are some cases in which the point of interest in prices is not the general tendency, but the deviation from it. The substitutes noted are chiefly of value in the discussion of wholesale prices. They fail utterly when retail prices are to be considered. In retail prices there is a wide variation, and the interest attaches to its extent. This has been the burden of several recent investigations into the course of retail prices. Any method which obliterates the distinctions between them must be faulty. Again, the prices paid in primary markets to the producers of agricultural products vary widely, not only from the market prices of such commodities in the principal distributing centres, but also from each other. In other words, the causes which affect the two classes of prices which we have named are totally distinct from those which govern market prices. An investigation of them must therefore proceed along other lines. No other plan meets the requirements of the case so fully as that of selecting representative establishments or representative primary markets and obtaining the prices in them. But, on the other hand, great care must be exercised in the formation of averages from such data, and it will be observed that the representative establishment plays a very different role in the statistics of prices from the "representative price" which has been discussed.

In the foregoing discussion, both of the true average and

of its various substitutes, no mention has been made of the limits of the inquiry either in time or locality. The discussion is applicable irrespective of these limits, but since it is evident that a price for the whole world, or for a whole century, would be comparatively worthless, attention must be given to these limits.

Let us suppose that the prices had been obtained by any of the methods above described in a given locality. It is evident that in order to cover a larger territory, as a state of a nation, the same methods must be used, theoretically speaking, as in a more restricted district. But to obtain wholesale prices in every locality where the goods were sold, and the volume of the sales, would be a manifest impossibility. We must assume that the prices in these localities are governed by the usual laws of trade, and that the course of prices of those places where the largest volume of sales occurs sufficiently represents the trend of prices for the nation. If a large number of places are selected, and all used in the formation of an average of rates, an equal importance is given to each place, and this may impair the result unless they are approximately equal. Thus in the Prussian figures a very considerable number of small towns in the neighborhood of Berlin are included. In taking an average of rates they may, if all should be higher or lower than Berlin, outweigh the latter in the result. In this respect the figures presented by the Imperial Statistical Office are superior, since they include only the most prominent markets.* In obtaining the wholesale prices, therefore, practical necessity, justified as we have seen by theoretical considerations, compels the statistician to confine his attention to the principal markets. On the other hand, if we consider the two classes of prices already noted as exceptions from the general rule, retail prices and prices paid to farmers, it is evident that to gain an idea of them from a considerable area that a larger number of points must be selected than in wholesale prices. The conditions govern-

* See for illustration *Monats hefte zur Statistik des deutschen Reiches*, Dezember, 1890.

ing retail prices differ in a village from those of a manufacturing town or a large city. The different classes of communities which are represented in the district in question should all be represented in the statistics of retail prices, and of prices paid to farmers. An admirable illustration of the application of these principles is to be found in the investigation of prices both wholesale and retail which is now being carried on by the Senate Committee on Finance. While for wholesale prices the main distributing points in the United States have been selected, for retail prices as many as seventy different points have been chosen, and for prices paid to farmers a still larger number. The details of this work will not be before the public for some months, but the plan has already been described by Mr. Carroll D. Wright in the *North American Review* for December, 1891.

Prices are quoted as daily, monthly, and yearly prices: The latter two may be derived from the former, or may be gathered independently according to any of the methods which have been described. Much depends upon the character of the commodity and of its sale. Staple articles are quoted daily, or else weekly. In ascertaining from the daily or weekly prices the monthly or yearly prices the usual rule is to simply take the average of the prices quoted without regard to the quantities which may have been sold on each day or week.* Such a process is only another application of the average of rates already discussed, and proceeds on the assumption that the volume of sales does not essentially differ from day to day, or from week to week. The difficulties which would surround the effort to estimate the volume of sales have already been alluded to, and prevent obtaining a true average. An exception to this rule is sometimes found in the statistics of prices of manufactured commodities, where

* This method is very generally applied in the trade journals, as in the *Bulletin of the American Iron and Steel Association*, and many others too numerous to mention. It is also applied in the statistics of the German Imperial Office already mentioned. The late Professor Beaujon (*Bulletin de l'Institut International de Statistique*, II, 146) speaks of average monthly prices as the basis of price statistics, and the derivation of average yearly prices from them.

the set price is obtained by dividing the total sales for a given period by the total product. This gives a true average price, but it is valueless for practical purposes unless the product consists of a single article, and is not made in different styles or qualities. These conditions are rarely realized in trade. Another form of price statistics, not unlike those just mentioned, are the average import and export prices of commodities. Statisticians are familiar with those published by the English Board of Trade, the French "Commission permanente des Douanes," and our own Treasury Department. There can be no doubt of such prices being true averages. But the prices so calculated will find a low level if the bulk of the goods are of inferior quality, and a high level if they are of superior grade. One can never know just what such a price represents, since the mixture of high and low grade goods may be infinitely varied. Though they have been frequently used, such statistics of prices seem the poorest that exist, and only of value in default of better. In this discussion of the extension of price statistics in time reference has been had to those articles which figure in the accounts of trade journals, and in like publications. It is unnecessary to dwell upon the fact that in an original investigation yearly prices may be obtained by some other methods. Taking into consideration the general laws of trade, it will be observed that whatever method is pursued, the possibility of variation is only as great as the difference between the highest and lowest prices paid in the year. In order to illustrate the effects of different methods in the calculation of yearly averages, we give a table which presents some calculations on the subject. In separate columns we present the actual prices paid during the year for a certain article, an average obtained by dividing the total of the prices by the number quoted, the mean between the highest and lowest prices, the average of the daily prices, and finally an average of the prices ruling at the beginning of each quarter. An examination of the table confirms what has already been said. When

the range of variation is wide the different methods pursued do not approximate so closely as when the range is small. In the latter case substantial agreement is observed.

TABLE I. COMPARISON OF AVERAGES.

	Price.	Duration of Price.	Average of Daily Prices.	Mean of Highest and Lowest.	Average of Rates.	Average of Prices at Opening of each Quarter.
	<i>Cents.</i>	<i>Days.</i>				
1857	137½	56	.....	.....	.....	.....
	140	93	134.246	137.5	137.500	136.975
	135	216	.....	.....	.....	.....
1858	120	365	120.000	120.0	120.000	120.000
1859	127½	90	.....	.....	.....	.....
	130	275	129.384	128.75	128.750	129.375
1860	130	79	.....	.....	.....	.....
	125	95	120.177	125.0	125.000	123.750
	120	182	.....	.....	.....	.....
1861	120	67	.....	.....	.....	.....
	125	235	124.045	125.0	125.000	123.750
	130	63	.....	.....	.....	.....
1862	130	178	.....	.....	.....	.....
	135	24	.....	.....	.....	.....
	140	40	.....	.....	.....	.....
	145	28	145.096	157.5	151.562	137.500
	150	18	.....	.....	.....	.....
	160	31	.....	.....	.....	.....
	167½	14	.....	.....	.....	.....
	185	32	.....	.....	.....	.....
1863	185	30	.....	.....	.....	.....
	200	25	.....	.....	.....	.....
	215	52	.....	.....	.....	.....
	200	115	200.452	200.0	197.500	195.000
	190	63	.....	.....	.....	.....
	200	49	.....	.....	.....	.....
	215	31	.....	.....	.....	.....
	215	49	.....	.....	.....	.....
1864	220	39	.....	.....	.....	.....
	225	17	.....	.....	.....	.....
	235	11	290.274	282.5	267.500	283.750
	250	36	.....	.....	.....	.....
	275	25	.....	.....	.....	.....
	300	12	.....	.....	.....	.....
	350	177	.....	.....	.....	.....
1865	350	88	.....	.....	.....	.....
	250	126	.....	.....	.....	.....
	265	54	.....	.....	.....	.....
	275	97	283.246	300.0	285.000	283.750
1866	275	92	.....	.....	.....	.....
	280	130	266.644	267.5	270.000	267.250
	275	143	.....	.....	.....	.....

We have shown that enumeration in the strict sense required by the theory of statistics is not practicable when prices are the subject of investigation. Resort must be had to various substitutes of greater or less accuracy according to circumstances. The character of these substitutes and some account of their application has been given, and we may now proceed to the second step in statistical inquiry, — comparison.

The comparison of the results of the enumeration is the final step in statistical processes. In the statistics of prices it seems to be the one feature of interest, but we have already demonstrated that an intelligent comparison is not possible without a careful criticism of the character of the information. The most important comparisons in price statistics are those between different localities, different periods of time, and different groups of prices, and they will claim our attention in this order.

The rules of statistical comparisons drawn from the theoretical consideration of the method are very numerous, though they may, perhaps, be summarized in the statement that no comparison is possible unless the analogy of the aggregates is sufficient, and the identity of the units is preserved. To this we should add a third rule in cases where an enumeration has not taken place, and it is that a similarity of the substitutes is necessary. The application of these principles to the usual statistics of population is so obvious that it need not be dwelt upon. It is our purpose to examine how far they throw light upon the comparisons of prices.

Let us consider, first, comparisons between the different localities. With respect to the analogy of the aggregates, it need only be said that this requires the self-evident rule not to compare one class of prices with another. Great care must be taken in making comparisons between localities to preserve intact the identity of the units. This is a matter oftentimes of the utmost difficulty. There are few products of commerce which are exactly the same the world over.

While, in a measure, this is true of certain agricultural products and raw materials of certain manufactures, when manufactured goods are considered, the greatest possible diversity is to be noted. The local comparisons of the prices of such staple articles as grain suffers frequently from a lack of uniform classification in the market quotations of the different commercial bodies.* Comparisons may be made between the prices of pig-iron in England and in the United States, and yet the manufacturer is well aware that a difference exists between the two kinds of pig-iron. Even rudest kinds of manufactured products differ not only from country to country, but from section to section. There is, for instance, no inconsiderable difficulty in comparing the price of cotton goods between Manchester and Fall River. When a higher class of manufactured goods is taken into consideration comparison is almost impossible. The utmost efforts are unavailing to secure any adequate basis for a comparison of the prices of silks as well as any other article which appeals to the fancy and artistic taste of the consumer. This wide diversity in the character of the products must lead to great caution in comparing the prices of articles in different localities even though the commodities be described as the same goods.

The force of what has been said in the preceding paragraph is much greater if we apply it to retail prices. The wide difference in prices which has been noted between articles of the same name, not only in different towns, but in different stores in the same town, forces us to the belief that the articles in question differ from one another in quality.† The taste of persons in different places varies, and this leads to differences in the quality of the goods sold. If this be true

* See the different nomenclature in the Statistics of the German Imperial Office, before noted.

† See on this point, Bayerdörffer, *Einfluss des Detail Handels auf die Preise*, *Schriften des Vereins für Sozial politik*, Vol. 37, 1888, p. 33. Also Cook, *Study of Retail Prices in Boston and Vicinity*, Vol. II of these Publications, p. 116. Similar experiences in the investigation of retail prices in France are noted by de Foville, *Bulletin du comité des travaux historiques et scientifiques*, Section des sciences économiques et sociales, Paris, 1888.

of groceries and household goods in every-day use, it is still more the case in regard to dry goods and other manufactured products. I have in mind an instance from the current investigation of the Senate Committee on Finance, where in the same store two articles corresponding to the description suggested by the committee were quoted at the prices of respectively 13 cents and 60 cents a yard. Experience proves that, however carefully the questions may be framed, it is utterly impossible to describe many articles in such a way that retail dealers throughout the entire country will understand exactly what is meant. In many cases the only adequate description of a manufactured article is too technical for the average merchant not versed in the process of manufacture to comprehend.

In comparing the prices of different localities care must be taken that the prices compared have been obtained according to the same method. Our discussion of substitutes showed that various methods might be employed to give an approximate idea of price, but it must not escape our attention that while the tendency of one method may be to give a result slightly higher than the true average, the tendency of another method may be exactly the reverse, hence the comparison of prices can only be absolutely satisfactory when the methods pursued in the different localities are identical. Cases might arise in which it was desirable to compare the relation of wholesale prices at different points, and ascertain whether the same relation held true in retail prices. In such a case a certain town could be taken as a basis, and the relation of wholesale prices in other towns be calculated. In similar fashion the retail prices could be calculated. The two series would be comparable irrespective of the fact that the wholesale prices might have been collected by one method and the retail by another.

The comparisons between prices at different times are much more numerous and much more fruitful of results than those between different localities. What has been said above with

reference to comparing prices of the same groups applies with equal force here.

The articles whose prices may be compared are subject to change, and it may occur that between the beginning and the end of the period the commodity has so changed its quality that it is not identical throughout.* This, of course, impairs the value of the comparison, but does not render it absolutely worthless, since allowance can be made for such changes in quality oftentimes with little difficulty. This applies to slight changes only. Where the change is great it may make a comparison utterly worthless. Staple articles, especially the raw products of agriculture, are less subject to change than manufactured products. Such improvements in the processes of agriculture as have taken place in recent years affect much more frequently the amount of the product and the economic working of the farms than the quality of the crops. None the less such changes do take place, and in comparing, for instance, the prices of sugar beets at the time when beet sugar was first produced with the price for such product today, an allowance should be made for the greater value of the latter through the increase in the sugar content which the improvement in agricultural methods has gradually brought out. Such instances are, however, rare, and in comparing the prices of this class of commodity we can be certain of a great degree of accuracy.

On the other hand, manufactured products have changed so frequently during the last century through the entirely changed conditions of manufacture that a comparison of prices at different periods seems well nigh impossible. So far as I know no attempt has been made to calculate such prices on a large scale in European countries, and, indeed, Haushofer† roundly declares that it cannot be done. This being the case, it may be well to notice in some detail the methods which have been employed by the Senate Committee

* Compare *Labor Statistics*, Connecticut, 1888, p. 88.

† Compare the recent edition of his *Lehr und Handbuch der Statistik*, chapter on prices.

on Finance in its current investigation. The greatest possible care has been exercised to obtain prices upon exactly the same commodity during a long period of years. The number of different articles in every branch of manufacture is so great, and the changes in quality have been so frequent, that it would be utterly impossible to collect prices of manufactured goods by including all products. On the other hand, in nearly every line of manufacture there is some special article which has remained substantially the same for a long period of years. Through conference with representatives of various manufacturers these articles have been ascertained. They have then been used as representatives of the group of manufactures to which they belong. Care has been exercised that the articles selected should be competitive articles, goods for which there has been in the past a considerable sale, and whose prices have been governed by market conditions. In the course of this investigation certain articles have been found which, while remaining substantially the same, have been subject to few fluctuations in prices. Upon inquiry it has been found that the sale of these articles has been a restricted one, that they did not enter into competition with the other grades of manufacture of the same class. Their price is therefore due to special conditions. It is needless to say that such a price, although preserving the identity of the unit, is not a market price in the sense in which that term is generally used. The great bulk of articles selected, however, are governed in prices by the usual conditions of trade, and it is believed that they will fairly represent the course of manufactured articles. In obtaining wholesale prices in this fashion of certain specific manufactured goods, the identity of the unit is admirably preserved.

In comparing prices of different periods it is found necessary to use information coming from different sources, and in such cases the greatest care must be exercised to ascertain whether the methods of figuring the prices have been identical. None of these methods are perfect, and, while one may

sin in the direction of too high a price, another may sin in the opposite direction. A series of prices for different years, formed partly according to one method and partly according to another, would, therefore, greatly impair the accuracy of the comparison. If, however, we desire to compare two series of prices, it is of comparatively little consequence whether the prices in the one case were obtained in the same fashion as in the other. In such a case it would not do to establish a ratio between the prices of the two series in each year, since such a ratio would probably be incorrect, but we can compare the prices of the two commodities as series. We do not compare their absolute amounts, but their relative variations. The simplest and most effective method of so doing is to take the price of some one year, as 100, and express the other prices of the same series in percentages of this price. The two series reduced to this common form are then absolutely comparable so far as their fluctuations are concerned.

The reason for the rule just stated has been clearly demonstrated in a recent article by Dr. Venn, on the *Nature and Uses of Averages*, in the *Journal of the Statistical Society* for September, 1891. He there shows that, while for some purposes particular classes of averages must be used, for the mere purpose of comparing groups of phenomena among themselves any form of average which approximately measures the facts will suffice. It must, therefore, be evident that, if from such averages we form a series, we can compare this series with another formed from other averages, even though the latter belong to a different class.

In comparing different groups of prices the analogy required by statistical theory is of a somewhat broader scope. In this case we consciously compare wholesale with retail prices, or farmers' prices with market prices, and the only analogy is in the fact that they are all prices of one class or another.

Comparison between wholesale and retail prices can only be made locally, that is, there must be a relation between the

wholesale and the retail prices. We would not compare the retail prices in Philadelphia with the wholesale prices in Chicago, but we might compare retail prices in Joliet with wholesale prices in Chicago, for it may be assumed that the retailer in Joliet either draws his supplies from Chicago, or that the wholesale prices of the latter place govern the wholesale prices in Joliet. The attempt has been made frequently of recent years to ascertain the amount charged by the retailer in excess of the wholesale price. Not only has this been attempted in cases where the retailer sells directly the goods which he has purchased, but in some few cases where a manufacturing process has taken place, as, for instance, comparing the price of bread with that of flour. The greatest difficulty in such comparison is the preservation of the identity of the unit. Take the simple case of coffee. The retail prices, while nominally for the same article as wholesale prices, differ so widely that the suspicion is awakened that a difference in quality must exist.* It need not be said that this difficulty will be overcome if we could ascertain from the retailer the price which he has paid for the articles. But few merchants are so imbued with the statistical spirit that they are willing to disclose their private affairs to this extent. While we can secure from the retailer the price which he charges his customers, we are obliged to secure the wholesale prices from different sources. Again, in retail trade the possibility of making profit on various kinds of adulteration is so great that it impairs the value of such comparison. The deterioration of goods which have been long in stock is another disturbing element.

Another difficulty in such comparisons arises from the fact that, while wholesale prices are apt to be averages, retail prices are usually collected in the form of concrete actual prices. We do not know whether the average price corresponds in any way with the price paid by the particular retailer, and our investigation must be very broad, even if this is true in the main.

* See Bayerdörffer's investigation, also the French investigation already noted.

If we desire to compare the retail prices of different periods with wholesale prices at the same periods, all the difficulties which we have remarked in comparing different localities apply with still greater force. The information which we can secure is not very accurate. The conditions which prevailed in the retail trade twenty or thirty years ago as compared with those of today are not sufficiently known to enable us to secure accurate data for comparison. If it is difficult to ascertain the relation of the wholesale to the retail prices today, it must be doubly so if our comparison is to be made in a more remote period.

On the other hand, it is not difficult to make a comparison of the course of prices. Just as we can compare the course of prices of two different commodities by reducing them to a series, so we can compare the course of retail prices with the course of wholesale prices of the same commodity by reducing each to a series. In this case, while we may not be sure that the articles compared are exactly the same, we can safely assume that each is representative, one showing the course of wholesale prices, and another the course of retail prices, and these two series may be compared. We can thus ascertain with considerable accuracy whether like tendencies have prevailed in the two branches of commerce, or if there has been a divergence, what has been its character.*

In conclusion, we may briefly restate the limitations upon statistical comparisons which result not only from the difficulty of observing the theoretical rules, but also from the character of the data at our command. For the reasons which we have given, comparisons of prices between different localities can only be made with the greatest caution. The possibility of error is very great. On the other hand, comparisons for different periods for the same article are comparatively easily made, and are fairly accurate. The conditions are such that we must accept local comparisons between different classes of prices only with extreme diffidence, while, on the

* See the tables in Bayerdörffer's study.

other hand, comparisons of this nature between different periods are comparatively accurate. It will be seen that the reduction of price series to common terms is of invaluable aid in all these comparisons.

This examination of the actual condition of price statistics has been carried on in the light of statistical theory as developed by Prof. Meitzen. Such investigations are the real test of statistical theory. If the latter makes clearer the difficulties which practical statisticians have encountered, and which they have endeavored to surmount, we can hope that the application of statistical theory to the various fields of practice will not only explain present difficulties, but help us to avoid obstacles in the future.

MEASURES OF DISTRIBUTION.

BY GEORGE K. HOLMES.

The problem that is the subject of this paper is to find a measure of distribution by which to establish a mathematical comparison of one group of persons with another in respect to the distribution of wealth. The aim is not to determine an individual's place in a group, nor to pay any attention to deviations from the mean. Individuals are to be out of mind, and attention is to be given to the group as a whole in relation to the mass of wealth which is possessed by it, or by a portion of it. The scheme would be inapplicable to an inquiry as to the distribution of black eyes or hereditary traits, but, it is hoped, will answer such a question as this, if statistics of all individual wealth holdings were at hand: "Is wealth more widely, evenly, and generously distributed in Massachusetts than in New York?"

The need of a precise measure of distribution applicable to wealth holdings first led to my study of the matter in 1884, when a scheme was devised that was submitted to the Massachusetts Bureau of Statistics of Labor in 1886. Since then, however, the publication of some of the results of an investigation of the distribution of wealth have been delayed, owing to the necessary priority of publication due to the results of the state census of 1885. The publication of this article, previous to the time when the measure of distribution that it describes may possibly be used by the Massachusetts Bureau, is with the permission of the Hon. Horace G. Wadlin, Chief of the Bureau.

Suppose that in a group of 100 persons — men, women, and children — fifteen persons each own wealth sufficient in amount to be worthy of consideration. One of these persons is worth \$2000; two, \$3000 each; ten, \$5000 each; and two

\$8500 each. In another group of 75 persons, nine persons own wealth, one of them being worth \$2000; four, \$3000 each; three, \$4000 each; and one, \$5000. As simple as these conditions are the character of the distribution of wealth in one of these groups cannot at a glance be compared with the character of the distribution in the other, and the problem is vastly more complicated to the observer who views large societies of millions of individuals.

The question is not fully answered by saying that in the first group the average holding of each of the 100 persons is \$750, and in the second \$413 for each of the 75 persons; nor by saying that the average holding for each of the fifteen wealth owners in the first group is \$5000, and in the second group of nine wealth owners \$3444. To rely solely upon an average would be a glaring misuse of it, since the average may be nearly the same in different groups of persons among whom wealth is very differently distributed. A million dollars may be so distributed among five owners that four of them own \$1000 apiece and one of them the remainder: or so distributed that one of them owns \$100,000; two, \$150,000 apiece; and two, \$300,000 apiece. The difference in unevenness of distribution is at once apparent, although the average wealth for each owner is \$200,000 in each group.

Nor is it sufficient to say that a certain proportion of the wealth owners own a certain proportion of the wealth, as, for instance, that one-third of the wealth owners in the group first mentioned own 43 per cent of the total wealth, and in the second group 42 per cent; because, as is the fact in these cases, the wealth may be more evenly diffused in the group in which the stated proportion of owners own the larger proportion of the wealth. The character of the comparison that may be made between results obtained in this way may depend upon the fraction of the members of the groups for whose wealth the fractional proportion of the total wealth of the group is ascertained. In some cases the relativity of the fractions of total wealth may be reversed if the adopted frac-

tion of the owners is one-tenth or some other fraction, instead of one-third or some other fraction, while the evenness or inequality of the distribution remains the same in the groups.

Since wealth as well as individuals must be taken into account, the first step is to separate wealth owners from non-owners. There is no distribution among those who do not own wealth; but, at the same time, social condition, so far as it depends upon the ownership of wealth, demands a distinct recognition of that proportion of the people who own none. This is expressed by a percentage. In some selected state 15 per cent of the people may have owned wealth in 1880 and 20 per cent in 1890. This definitely indicates an increase in the width of distribution.

The wealth owners are now set apart for further consideration. The aggregate of wealth may be mostly in the hands of the few or of the many, and it must be known how much wealth each owner possesses. If the same amount is owned by each person, there is equality of distribution; if a few, comparatively, have very large holdings and the many have small holdings, there is great inequality of distribution. It becomes necessary then to represent the number of wealth owners in a table in the common orderly arrangement, together with the amount of wealth possessed by each owner or class of owners. This arrangement is on a progressive scale, with the poorest person, or class, at one extreme, and the richest person, or class, at the other. Upon experimenting with such a tabulation it will be noticed that groups of wealth owners may be represented by five distinct types of arrangement, as shown in Tables I and II on following page.

It is requested that attention may first be confined to the arrangement of the number of owners in Table I. The peculiarities of the five types of groups of wealth owners in regard to their distribution under the progressive scale of classification appear at sight. In Type 1 the numbers are massed among the middle classes with uniform decrease from the middle class toward the extremes. In Type 2 the num-

TABLE I.

Classification of Owners.	Type 1.		Type 2.		Type 3.		Type 4.		Type 5.	
	Number of Owners.	Amount Owned.	Number of Owners.	Amount Owned.	Number of Owners.	Amount Owned.	Number of Owners.	Amount Owned.	Number of Owners.	Amount Owned.
\$1	1	\$1	1	\$1	15	\$15	2	\$2	8	\$8
2	2	4	2	4	14	28	2	4	7	14
3	3	9	3	9	13	39	2	6	6	18
4	4	16	4	16	12	48	2	8	5	20
5	5	25	5	25	11 $\frac{6}{5}$	55	2	10	4	20
6	6	36	6	36	10	60	2	12	3	18
7	7	49	7	49	9	63	2	14	2	14
8	8 $\frac{4}{4}$	64	8	64	8	64 $\frac{32}{8}$	2 $\frac{1}{1}$	16	1 $\frac{1-2}{1-2}$	8
9	7	63 $\frac{52}{11}$	9	81	7	63	2	18	2	18
10	6	60	10	100	6	60	2	20	3	30
11	5	55	11 $\frac{5}{5}$	121	5	55	2	22 $\frac{10}{12}$	4	44
12	4	48	12	144 $\frac{114}{30}$	4	48	2	24	5	60
13	3	39	13	169	3	39	2	26	6	78 $\frac{12}{66}$
14	2	28	14	196	2	28	2	28	7	98
15	1	15	15	225	1	15	2	30	8	120

TABLE II.

MEASURES OF DISTRIBUTION.

Description.	Type 1.	Type 2.	Type 3.	Type 4.	Type 5.
Median for amount.....	\$9.82 $\frac{34}{61}$	\$12.79 $\frac{1}{8}$	\$8.50	\$11.45 $\frac{5}{11}$	\$13.15 $\frac{5}{13}$
“ “ number.....	8.50	11.45 $\frac{5}{11}$	5.54 $\frac{6}{11}$	8.50	8.50
Difference.....	1.32 $\frac{34}{63}$	1.33 $\frac{47}{64}$	2.95 $\frac{3}{11}$	2.96 $\frac{5}{11}$	4.65 $\frac{5}{12}$
Percentage of owners of population.....	23	17	18	15	12
Average holding.....	\$8.00	\$10.33 $\frac{1}{3}$	\$5.66 $\frac{2}{3}$	\$8.00	\$8.00

bers uniformly increase from the smallest extreme to the largest, and in Type 3 the reverse is true. There is an equal distribution of numbers among the classes of Type 4. Type 5 is the reverse of Type 1, and its numbers uniformly increase from the middle to the extremes. That any existing group

of wealth owners would present so uniform an arrangement as one of these it cannot be supposed, but it must do so with more or less approximation. These uniform arrangements are adopted for bringing out more clearly the principle that follows.

Upon directing attention to the amounts of wealth owned by the classes of owners, it will be noticed that they are not always so uniformly distributed as the numbers of owners are; and, although progressions are apparent, they are stronger for amount of wealth than for number of owners. The reason for this is the multiplication of number of owners into a progressive scale. By adding one person to the class of owners of \$12, not \$1 but \$12 is added to the amount of wealth owned by this class; and by adding one person to the class of owners of \$2, only \$2 is added to the amount of wealth owned by the same class. Hence it is necessary to take account of wealth as well as of the number of its owners in comparing the evenness or inequality of the distribution of their wealth; and, in comparing two or more groups of wealth owners, it follows that to the extent that the greater proportion of the total mass of the wealth of a group of owners is owned by the smaller proportion (not the same proportion) of the total number of owners its distribution is the more unequal; and to the extent that the greater proportion of the total mass of wealth is owned by the greater proportion of the owners it is the more evenly distributed. It is now more apparent than before that to say that an arbitrarily selected fraction of the members of a group of wealth owners own a certain fraction of the group's wealth does not meet the requirements of the problem. This method is so commonly employed that it is again referred to.

Again, it follows that to the extent that the greater proportion of the mass of the total number of owners occupy a place in the scale of classification approaching the place in the scale occupied by the greater proportion of the mass of the wealth owned the distribution is the more equal. What

is required, then, is the finding of the places in the scale of classification occupied by the greater proportion of the total number of owners, and of the total amount of the wealth owned by the whole group; or, if the distribution is very uneven, the finding of the places in the scale where a mass of owners from one extreme meets an equal mass of owners from the other extreme, and the same result for the amount of wealth owned. Such, indeed, is practically the requirement, whatever the inequality or evenness of the distribution may be.

This is accomplished by finding the medians for number of owners and amount of wealth, and the measure of the distance between the medians is the measure of the inequality of distribution. If one person be added to the class of persons owning \$1, the same amount is added to the amount of wealth owned by this class, and if one person is added to the class of persons possessing \$15, \$15 is added to the wealth of this class; the median for number of owners is not disturbed thereby, but the median for amount is shifted toward the higher extreme and away from the median for number; the distribution has become more unequal and the measure increased.

Application of this principle has been made to the five types of arrangement presented in Table I. (See Table II.) In Type 1 the median for number is \$8.50; that is, the mathematical place of the median in the scale of classification is \$8.50, although there is no person possessing this amount. There are 64 persons in this group of owners, and half of these are on each side of the median. This divides the class of eight persons, each of whom owns wealth worth \$8, so that half of their number, or 50 per cent, is on each side of the median. The four persons, or 50 per cent, on the poorer side of the median in this class are represented in the scale by a corresponding mathematical place, which is \$8 plus, not 50 per cent of \$8, but 50 per cent of the class as a unit; that is, the median is at a place in the scale where the actual holding

Officers of the American Statistical Association.

ORGANIZED NOVEMBER 27, 1889.

President, FRANCIS A. WALKER, PH.D., LL.D.

Vice-Presidents, GEORGE C. SHATTUCK, M.D.; HAMILTON A. HILL, A.M.; HON. CARROLL D. WRIGHT; RICHMOND MAYO-SMITH, A.M.; HON. HORACE G. WADLIN.

Corresponding Secretary, EDWARD ATKINSON, LL.D.

Treasurer, JOHN S. CLARK, Esq. Address, 646 Washington St., Boston, Mass.

Secretary and Librarian, DAVIS R. DEWEY, PH.D. Address, Institute of Technology, Boston, Mass.

Members of the American Statistical Association.

HONORARY MEMBERS.

BODIO, LUIGI, SIG., Rome, Italy.

BOSCO, DR. AUGUSTE, Rome, Italy.

KORÖSI, DR. JOSEPH, Buda-Pesth, Hungary.

RABBENO, PROF. UGO, Bologna, Italy.

ROSSI, DR. EGISTO, Rome, Italy.

ABBOTT, DR. SAMUEL W., Secretary State Board of Health, 18 Beacon Street, Boston, Mass.

ABBOTT, EDWIN HALE, Esq., 1 Follen Street, Cambridge, Mass.

ADAMS, PROF. HENRY CARTER, PH.D., Statistician Interstate Commerce Commission, University of Michigan, Ann Arbor, Mich.

ADDICKS, J. EDWARD, Esq., 24 West Street, Boston, Mass. Life Member.

ALDRICH, H. H., Esq., 92 Board of Trade Building, Chicago, Ill.

ALLEN, PROF. C. FRANK, S.B., Institute of Technology, Boston, Mass.

ALLEN, GEORGE H. H., Esq., New Bedford, Mass.

ALLEN, W. F., Editor *Official Railway Guide*, 24 Park Pl., New York.

ALLEN, WALTER S., S.B., Secretary Board of Gas and Electric Light Commissioners, 18 Beacon Street, Boston, Mass.

ALVORD, MAJOR HENRY E., President Agricultural College, Maryland.

ANDREWS, PRESIDENT ELISHA BENJAMIN, D.D., LL.D., Brown University, Providence, R. I.

ANGELL, STEPHEN H., Esq., 38 Rue de Provence, Paris, France.

ARMSTRONG, COLLIN, Esq., 80 Broadway, New York.

ATHERTON, PRESIDENT GEORGE W., State College, Centre County, Pa.

ATKINSON, EDWARD, LL.D., 31 Milk Street, Boston, Mass.

BAILEY, DUDLEY P., Esq., 27 School Street, Boston, Mass.

BAKER, M. N., Esq., Associate Editor *Engineering News*, New York.

BAKER, WILLIAM T., Esq., 138 Jackson Street, Chicago, Ill.

BARKER, WHARTON, Esq., 429 Chestnut Street, Philadelphia, Pa.

BARNES, DAVID L., Esq., The Rookery, Chicago, Ill.

BARNES, THURLOW WERD, Esq., 4 Park Street, Boston, Mass.

- BARNES, WILLIAM E., Editor *Age of Steel*, St. Louis, Mo.
 BATES, THEODORE C., Esq., 29 Harvard Street, Worcester, Mass.
 BEAVER, GEN. JAMES A., LL.D., Bellefonte, Pa.
 BELL, ALEXANDER GRAHAM, Esq., 1336 Nineteenth St., Washington.
 BELL, EDWARD W., Esq., 18 Cortlandt Street, New York.
 BEMIS, PROF. EDWARD W., PH.D., Vanderbilt University, Nashville, Tenn.
 BERARD, EUGENE, Esq., 37 Second Place, Brooklyn, N. Y.
 BERGEY, D. H., M.D., North Wales, Pa.
 BEVERIDGE, DAVID, Esq., Room 1133, The Rookery, Chicago, Ill.
 BEYER, HENRY G., M.D., Naval Academy, Annapolis, Md.
 BIDDLE, A. SYDNEY, Esq., 208 South Fifth Street, Philadelphia, Pa.
 BILLGRIST, C. EDWARD, Esq., 45 William Street, New York.
 BILLINGS, DR. JOHN S., LL.D., Surgeon U. S. A., Army Medical Museum and Library, Washington.
 BILLINGS, ROBERT C., Esq., 66 Franklin Street, Boston, Mass.
 BIRTWELL, CHARLES W., Esq., 43 Charity Building, Chardon Street, Boston, Mass.
 BLAIR, THOMAS S., Esq., Tyrone, Pa.
 BLODGETT, JAMES H., Esq., Special Agent for Educational Statistics, Census Office, Washington.
 BOAS, FRANZ, PH.D., Clark University, Worcester, Mass.
 BOORAEM, J. V. V., Esq., 204 Lincoln Place, Brooklyn, N. Y.
 BOURNE, PROF. EDWARD G., Adelbert College, Cleveland, O.
 BOWDITCH, PROF. HENRY P., M.D., Harvard Medical School, Boston, Mass.
 BOWKER, R. R., Esq., *Publishers' Weekly*, 330 Pearl Street, New York.
 BOYD, C. R., Esq., Wythville, Va.
 BRACKETT, JEFFREY R., PH.D., 106 North Avenue, Baltimore, Md.
 BRADLEE, ARTHUR T., Esq., 78 Chauncey Street, Boston, Mass.
 BRADLEE, REV. CALKB DAVIS, A.M., 57 West Brookline St., Boston, Mass.
 BRADLEY, JOHN T., Esq., 134 State Street, Boston, Mass.
 BRAGDON, PROF. C. C., M.A., Lasell Seminary, Auburndale, Mass.
 BRECKINRIDGE, HON. WILLIAM C. P., M. C., Washington.
 BRECKINRIDGE, HON. CLINTON R., M. C., Washington.
 BREED, FRANCIS W., Esq., Lynn, Mass.
 BREED, W. J., Esq., 128 Pike St., Cincinnati, Ohio.
 BRONSON, HENRY, Esq., 1198 Chapel Street, New Haven, Conn.
 BROOKS, GEORGE B., Esq., Saginaw, East Side, Mich.
 BROOKS, REV. JOHN G., Brockton, Mass.
 BULLOCK, CHARLES J., Esq., Principal High School, Middlebury, Vt.
 BUTLER, GEORGE A., Esq., President National Tradesmen's Bank, New Haven, Conn.
 CALKINS, GARY N., B.S., 99 Pinckney Street, Boston, Mass.
 CAMPBELL-COPELAND, T., Esq., Statistics of Wealth, Debt, and Taxation, Census Office, Washington.
 CANNON, JAMES G., Esq., Vice-President Fourth National Bank, New York.
 CARPENTER, GEORGE O., Esq., 13 Central Street, Boston, Mass.
 CARTER, JOHN W., Esq., 162-172 Columbus Avenue, Boston, Mass.

- CASE, JAMES B., Esq., President Bank of Republic, Boston, Mass.
CHANDLER, ALFRED N., Esq., 143 S. Fourth Street, Philadelphia, Pa.
CHAPIN, PROF. CHARLES V., M.D., Brown University, Providence, R. I.
CHASE, CHARLES P., Esq., Hanover, N. H.
CHASE, SIMEON B., Esq., Fall River, Mass.
CLARK, CLARENCE H., Esq., 42nd and Locust Streets, Philadelphia, Pa.
CLARK, E. W., Esq., Bullitt Building, Philadelphia, Pa.
CLARK, JOHN S., Esq., 646 Washington Street, Boston, Mass.
CLARK, PROF. JOHN B., Smith College, Northampton, Mass.
CLARKE, HON. JULIUS L., West Newton, Mass.
COATES, WILLIAM M., Esq., 127 Market Street, Philadelphia, Pa.
COFFIN, WINTHROP, Esq., Thomson Houston Electric Co., 620 Atlantic Avenue, Boston, Mass.
COLE, WILLIAM M., Esq., Harvard University, Cambridge, Mass.
COLIE, EDW. M., Esq., 776 Broad Street, Newark, N. J.
COMMONS, PROF. JOHN R., Oberlin College, Oberlin, Ohio.
COOLEY, CHARLES H., Esq., Sun Building, Washington.
COXE, BRINTON, Esq., 1711 Locust Street, Philadelphia, Pa.
CRAIG, OSCAR, Esq., President State Board of Charities, Rochester, N. Y.
CRAPO, HON. WM. W., New Bedford, Mass.
CREHORE, DR. C. F., Secretary Society for Promotion of Good Citizenship, Box 1252, Boston, Mass.
CROCKER, GEORGE G., Esq., 19 Milk Street, Boston, Mass.
CROCKER, URIEL H., Esq., 247 Commonwealth Avenue, Boston, Mass.
CROWELL, PRESIDENT JOHN F., Trinity College, N. C.
CUMMINGS, EDWARD, Esq., 19 Ware Street, Cambridge, Mass.
CURRIER, C. F. A., Esq., Institute of Technology, Boston, Mass.
CURTIS, GEORGE W., Esq., President City Bank, New Haven, Conn.
CURTIS, HON. WILLIAM E., 1801 Connecticut Avenue, Washington.
CUTTING, R. FULTON, Esq., 32 Nassau Street, New York.
DALZIEL, JOHN A., Esq., Box 481, Rochester, N. Y.
DAVIS, WILLIAM HENRY, Esq., 123 E. Fourth Street, Cincinnati, O.
DEAN, JOHN WARD, A.M., Editor *Historical and Genealogical Register*, 18 Somerset Street, Boston, Mass. Life Member.
DEERING, WM., Esq., Eighth Street and Garland Avenue, Louisville, Ky.
DEMING, HORACE E., Esq., 58 William Street, New York.
DENSLOW, VAN BUREN, LL.D., 58 William Street, New York.
DEWEY, PROF. DAVIS R., Ph.D., Institute of Technology, Boston, Mass.
DEXTER, HON. SEYMOUR, Ph.D., Elmira, N. Y.
DIKE, REV. SAMUEL W., LL.D., Secretary National Divorce Reform League, Auburndale, Mass.
DODGE, HON. J. R., Statistician, Dept. of Agriculture, Washington.
DOLGE, ALFRED, Esq., Dolgeville, N. Y.
DORCHESTER, REV. DANIEL, D.D., Roslindale, Mass.
DORNAN, ROBERT, Esq., Oxford and Mascher Streets, Philadelphia, Pa.
DOW, CLARENCE, Esq., *The Globe*, Boston, Mass.
DRAPER, FRANK W., M.D., 36 Worcester Street, Boston, Mass.

4 *Members of the American Statistical Association.*

- DRAPER, GEN. WILLIAM F., Hopedale, Mass.
 DROWN, FRANK H., Esq., Bureau of Labor, 20 Beacon St., Boston, Mass.
 DUDLEY, CHARLES B., Esq., 1219 12th Avenue, Altoona, Pa.
 DUDLEY, HON. THOMAS H., Camden, N. J.
 ELDRIDGE, GEORGE D., Esq., Central National Bank Building, Washington.
 ELY, PROF. RICHARD T., Ph.D., Johns Hopkins University, Baltimore, Md.
 ENDICOTT, WILLIAM, JR., A.M., 85 Devonshire Street, Boston, Mass.
 ENDICOTT, WILLIAM C., Esq., Salem, Mass.
 ENEBUSKE, CLAES J., 18 Prescott St., Cambridge, Mass.
 FAIRCHILD, HON. CHARLES S., President N. Y. Security and Trust Co.,
 76 Clinton Place, New York.
 FALKNER, PROF. ROLAND P., Ph.D., University of Pennsylvania, Philadelphia, Pa.
 FALKNER, DR. GEORGE, Greenough Avenue, Jamaica Plain, Mass.
 FARNAM, PROF. HENRY W., 48 Hillhouse Avenue, New Haven, Conn.
 FERGUSON, PROF. HENRY, Trinity College, Hartford, Conn.
 FIELD, MARSHALL, Esq., Chicago, Ill.
 FITZ, EUSTACE C., M. A., President Blackstone National Bank, Boston.
 FITZGERALD, DESMOND, Esq., Brookline, Mass.
 FLAD, HENRY, Esq., President Board of Public Improvement, St. Louis, Mo.
 FOOTE, ALLEN R., Esq., Census Office, Washington.
 FORD, FRANKLIN, Esq., Dundee, Mich.
 FORD, WORTHINGTON C., Esq., Department of State, Washington.
 FOSTER, WILLIAM H., Esq., Geneseo, Ill.
 FOUSE, L. G., Esq., President Fidelity Mutual Life Association, 914 Walnut Street, Philadelphia, Pa.
 FURBER, HARRY J., JR., Esq., Chicago, Ill.
 GAGE, LYMAN J., Esq., 470 N. State Street, Chicago, Ill.
 GALE, SAMUEL C., Esq., Minneapolis, Minn.
 GANNETT, HENRY, A.M., Chief Geographer U. S. Geological Survey, Washington.
 GARDNER, PROF. HENRY B., Brown University, Providence, R. I.
 GARRARD, JEPHTHA, Esq., 44 Johnston Building, Cincinnati, Ohio. Life Member.
 GARRETT, JOHN B., Esq., Rosemount, Pa.
 GARRISON, PROF. GEORGE P., University of Texas, Austin, Texas.
 GIDDINGS, PROF. F. H., Bryn Mawr College, Bryn Mawr, Pa.
 GILBERT, W. J., Esq., 205 N. Fourth Street, St. Louis, Mo.
 GLEASON, HON. DANIEL A., 31 Milk Street, Boston, Mass.
 GLENN, JOHN, Esq., 38 Glenn Building, Baltimore, Md.
 GOODHUE, PROF. HORACE, A.M., Dean of Faculty, Carleton College, Northfield, Minn.
 GOULD, E. R. L., Ph.D., Department of Labor, Washington.
 GRAY, JOHN H., A.M., Karlstrasse 22 II, Halle, Germany.
 GREEN, HON. SAMUEL A., A.M., M.D., Librarian Mass. Historical Society, 30 Tremont Street, Boston, Mass. Life Member.

- GREEN, JOHN, Esq., *Bradstreet's*, New York.
- GREENE, DAVID I., Esq., Johns Hopkins University, Baltimore, Md.
- GREENE, WILLIAM B., Esq., 128 Broadway, New York.
- GREENLEAF, DR. CHARLES R., Surgeon-General's Office, Washington.
- GRIFFIN, CAPTAIN EUGENE, Thomson Houston Electric Co., 620 Atlantic Avenue, Boston, Mass.
- GROVER, WILLIAM O., Esq., 17 Arlington Street, Boston, Mass.
- GULICK, LUTHER, M.D., Springfield, Mass.
- GUNTON, GEORGE, Esq., 226 E. 15th Street, New York.
- HADLEY, PROF. ARTHUR T., Yale University, New Haven, Conn.
- HALE, GEORGE S., A.M., 10 Tremont Street, Boston, Mass.
- HALL, PROF. W. S., M.D., Haverford College, Pa.
- HALNEY, PROF. JOHN J., Lake Forest University, Lake Forest, Ill.
- HARDY, ALPHEUS H., Esq., 35 Brimmer Street, Boston, Mass.
- HART, PROF. ALBERT BUSHNELL, Ph.D., Harvard University, Cambridge.
- HART, REV. H. H., Board of Charities and Corrections, St Paul, Minn.
- HARTER, HON. M. D., M. C., Washington. Life Member.
- HARTWELL, EDWARD M., M.D., Director Physical Culture, Boston Schools, 5 Brimmer Street, Boston, Mass.
- HATHAWAY, FRANK R., Esq., Yonkers, N. Y.
- HAVEN, FRANKLIN, JR., A.M., President Merchants National Bank, Boston.
- HAZARD, ROWLAND, A.M., Providence, R. I.
- HAZEN, REV. HENRY A., Secretary National Council of the Congregational Churches of the U. S., Congregational House, Boston, Mass.
- HEAD, JAMES M., Esq., Cole Building, Nashville, Tenn.
- HEWITT, HON. ABRAM S., New York.
- HICKS, PROF. FRED. C., Missouri State University, Columbia, Mo.
- HIGGINSON, HENRY L., Esq., 191 Commonwealth Avenue, Boston.
- HILL, HON. HAMILTON ANDREWS, A.M., 79 Newbury Street, Boston, Mass.
- HITCHCOCK, PROF. EDWARD, M.D., Amherst College, Amherst, Mass.
- HITCHCOCK, EDWARD, JR., M.D., Cornell University, Ithaca, N. Y.
- HOBBS, FRANKLIN W., Esq., Brookline, Mass.
- HODDER, PROF. F. H., Ph.M., Kansas State University, Lawrence, Kan.
- HOLLERITH, H., Ph.D., 617 Seventh Street, Washington.
- HOLMES, GEORGE K., Esq., Census Office, Washington.
- HOLT, HENRY, Esq., Publisher, New York.
- HOOPER, WILLIAM, Esq., Agent Atlantic Cotton Mills, 87 Milk St., Boston.
- HOPKINS, A. P., Esq., Commercial National Bank, Omaha, Neb.
- HOTCHKISS, HON. SAMUEL M., Commissioner of Labor Statistics, Hartford, Conn.
- HOWE, LUCIEN, M.D., 188 Delaware Avenue, Buffalo, N. Y.
- HOWES, OSBORNE, JR., Esq., 70 Kilby Street, Boston, Mass.
- HUNT, WILLIAM C., Esq., Census Office, Washington.
- HUTCHINS, HON. E. R., Bureau of Labor Statistics, Des Moines, Ia.
- HUTCHINSON, CHARLES HARE, Esq., 1617 Walnut Street, Philadelphia, Pa. Life Member.
- HUTCHINSON, C. L., Esq., President Corn Exchange Bank, Chicago, Ill.

- HUNNEWELL, JAMES F., Esq., 13 Green Street, Charlestown, Mass.
 HYDE, H. S., Esq., President Agawam Bank, Springfield, Mass.
 JAMES, C. C., Esq., Secretary Bureau of Industries, Dept. of Agriculture, Toronto, Canada.
 JAMES, HON. DARWIN R., 123 Malden Lane, New York.
 JAMES, PROF. E. J., Ph.D., University of Pennsylvania, Philadelphia, Pa.
 JENKS, PROF. J. W., Ph.D., Cornell University, Ithaca, N. Y.
 JENNEY, CHARLES A., Esq., Division of Insurance, Census Office, Washington.
 JOHNSTON, JOHN, Esq., Wisconsin Marine & Fire Insurance Co. Bank, Milwaukee, Wis.
 JONES, SENATOR JOHN P., Washington.
 KEATON, CHARLES E. H., Esq., Nostrand and Park Aves., Brooklyn, N. Y.
 KEELER, BRONSON C., Esq., Commercial Building, St. Louis, Mo.
 KELLY, THOMAS C., Esq., Columbia Athletic Club, Washington.
 KENDALL, JOSEPH S., Esq., 66 Franklin Street, Boston, Mass.
 KELLING, HENRY, Esq., Clerk of Board of Trade, Walla Walla, Wash.
 KINGHORN, H. B. Esq., 21 Park Row, New York.
 KINLEY, DAVID, Esq., Johns Hopkins University, Baltimore, Md.
 KURNHEEDT, MANUEL A., Esq., 35 Warren Street, New York.
 LAMB, HENRY W., Esq., Brookline, Mass.
 LAMBORN, DR. ROBERT H., 21 Nassau Street, New York.
 LANE, HON. JONATHAN A., 266 Devonshire Street, Boston, Mass.
 LAUGHLIN, PROF. J. LAURENCE, Ph.D., Cornell University, Ithaca, N. Y.
 LAWRENCE, GEN. SAMUEL C., Medford, Mass.
 LEA, HENRY C., Esq., 2000 Walnut St., Philadelphia, Pa. Life Member.
 LEE, BENJAMIN, M.D., Secretary State Board of Health and Vital Statistics, Philadelphia, Pa.
 LEE, COL. HENRY, A.M., Manager Union Safe Deposit Vaults, Boston. Life Member.
 LEE, JOSEPH, Esq., Brookline, Mass.
 LINDSAY, A. G., Esq., 93 Griswold Street, Detroit, Mich.
 LIONBERGER, JOHN R., Esq., St. Louis, Mo.
 LITTLE, SAMUEL, Esq., President Rockland Bank, Roxbury, Mass.
 LOEWY, BENNO, Esq., 206 and 208 Broadway, New York.
 LOGAN, JAMES, Esq., 75 Grove Street, Worcester, Mass.
 LOGAN, WALTER S., Esq., 58 William Street, New York.
 LORD, HON. JOHN S., Bureau of Labor Statistics, Springfield, Ill.
 LORING, CALEB WILLIAM, LL.B., 22 Congress Street, Boston, Mass.
 LOW, HON. SETH, LL.D., President Columbia College, New York.
 LOWNDES, LLOYD, Esq., President Second Natl. Bank, Cumberland, Md.
 LYMAN, ARTHUR T., Esq., P. O. Box 1717, Boston, Mass.
 MACNAIR, PROF. THEODORE M., Meiji Gakuin College, Tokio, Japan.
 MACVEAGH, FRANKLIN, Esq., Chicago, Ill.
 MAIN, CHARLES T., Esq., 65 Westminster Street, Providence, R. I.
 MANSFIELD, GEORGE W., Esq., 620 Atlantic Avenue, Boston, Mass.
 MARSHALL, CHARLES C., Esq., 35 William Street, New York.

- MASON, A. F., Esq., Brookline, Mass.
 MASON, E. C., Esq., 377 Main Street, Buffalo, N. Y.
 MASON, LYMAN, A.M., 24 Congress Street, Boston, Mass. Life Member.
 MATTHEWS, HON. NATHAN, JR., 23 Court Street, Boston, Mass.
 MAYO-SMITH, PROF. RICHMOND, Columbia College, New York. Life Member.
 MCBRYDE, PRESIDENT J. M., University of So. Carolina, Columbia, S. C.
 McDUFFIE, JOHN, Esq., McDuffie Girls' School, Springfield, Mass.
 McGEHEE, CHARLES CHRISTOPHER, Esq., Atlanta, Ga.
 McLAREN, WILLIAM P., Esq., 16 New Insurance Building, Milwaukee, Wis.
 MEAD, EDWIN D., Esq., 73 Pluckney Street, Boston, Mass.
 MERCER, GEORGE GLUYAS, Esq., Drexel Building, Philadelphia, Pa.
 MILLER, A. C., Esq., Cornell University, Ithaca, N. Y.
 MINOT, WM., JR., Esq., 39 Court Street, Boston, Mass.
 MINOT, FRANCIS, M.D., 65 Marlborough Street, Boston, Mass.
 MOORE, ALEXANDER, Esq., 3 School Street, Boston, Mass.
 MORRISON, JOHN H., Esq., 40 Water Street, Boston, Mass.
 MORSE, HON. LEOPOLD, 203 Commonwealth Avenue, Boston, Mass.
 MORSE, S. E., Esq., Editor *Indiana Sentinel*, Indianapolis, Ind.
 MURRAY, CHARLES B., Esq., Editor *Cincinnati Price Current*, 170 Race Street, Cincinnati, O.
 NEAD, BENJ. M., Esq., Harrisburg, Pa.
 NELSON, N. O., Esq., Eighth and St. Charles Streets, St. Louis, Mo.
 NEWCOMB, PROF. SIMON, 1620 P Street, N. W., Washington.
 NEWMAN, A. L., Esq., President Bank of Commonwealth, Boston, Mass.
 NORTH, S. N. D., Esq., Secretary National Association of Wool Manufacturers, 70 Kilby Street, Boston, Mass.
 NOURSE, BENJAMIN F., Esq., 33 Federal Street, Boston, Mass.
 ODELL, J. J. P., Esq., President Union National Bank, Chicago, Ill.
 OLNEY, GEORGE W., LL.B., *The Weekly Underwriter*, 58 William Street, New York.
 OTIS, EDWARD O., M.D., 93 Mt. Vernon Street, Boston, Mass.
 PAGE, EDWARD D., Esq., 61 Leonard Street, New York.
 PAIGE, JOHN C., Esq., 20 Kilby Street, Boston, Mass.
 PAINE, ROBERT TREAT, A.M., 6 Joy Street, Boston, Mass.
 PARKS, S. CONANT, Esq., First Lander Bank, Lander, Wy.
 PATTEN, PROF. SIMON N., PH D., University of Pennsylvania, Philadelphia, Pa.
 PECK, S. C., Esq., Thomson Houston International Electric Co., 620 Atlantic Avenue, Boston, Mass.
 PERRY, CHARLES B., Esq., Actuary's Department, Mutual Life Insurance Co., New York.
 PERRY, MARSDEN J., Esq., 270 Benefit Street, Providence, R. I.
 PETERSEN, J. S., Esq., Atlanta, Ga.
 PHELPS, WILLIAM F., Esq., 105 Germania Life Building, St. Paul, Minn.
 PIDGIN, CHARLES F., Esq., Bureau of Labor Statistics, 20 Beacon Street, Boston, Mass.

- PIERSON, ISRAEL C., Esq., 21 Cortlandt Street, New York.
- PLEHN, PROF. CARL, Ph.D., Middlebury College, Middlebury, Vt.
- POMEROY, ALTWEED, Esq., 266 Halsey Street, Newark, N. J.
- POPE, COL. ALBERT A., 221 Columbus Ave., Boston, Mass. Life Member.
- POPE, WILLIAM J., Esq., 220 Phenix Building, Chicago, Ill.
- PORTER, HON. ROBERT P., Superintendent U. S. Census, Washington.
- PORTER, PROF. DWIGHT, Institute of Technology, Boston, Mass.
- POTTS, BENJ. C., Esq., Media, Pa.
- PRICE, J. A., Esq., Scranton, Pa.
- PRICHETT, PROF. H. S., Washington University, St. Louis, Mo.
- PROUT, H. G., Esq., Editor *Railroad Gazette*, New York.
- PUMPELLY, PROF. RAPHAEL, U. S. Geological Survey, Newport, R. I.
- QUINCY, JOSIAH, Esq., 66 State Street, Boston, Mass.
- RAUCH, JOHN C., M.D., Secretary State Board of Health, Springfield, Ill.
- REED, HENRY R., Esq., 23 Broad Street, Boston, Mass.
- REYNOLDS, REV. GRINDALL, Concord, Mass.
- RHAWN, WILLIAM H., Esq., 313 Chestnut Street, Philadelphia, Pa.
- RICE, ISAAC L., Esq., 52 Wall Street, New York.
- RICH, GEORGE A., Esq., *The Journal*, Boston, Mass.
- RICHARDSON, SPENCER W., Esq., 40 Water Street, Boston, Mass.
- RIPLEY, GEORGE, Esq., President Hide and Leather National Bank, Boston.
- RIPLEY, WILLIAM Z., S.B., Fellow Columbia College, New York.
- RIPPEY, CHARLES MACKAY, Esq., 296 Park Street, Detroit, Michigan.
- ROGERS, WILLIAM B., Esq., Treasurer Western Saving Fund Society, 1000 Walnut Street, Philadelphia, Pa.
- ROPES, JOHN C., LL.B., 99 Mt. Vernon Street, Boston, Mass.
- ROSE, JOHN C., Esq., 106 E. Saratoga Street, Baltimore, Md.
- ROUND, WM. M. F., Esq., 135 E. 15th Street, New York.
- SALMON, LUCY M., Professor in History, Vassar College, Poughkeepsie, N. Y.
- SARDA, HAR BILAS, B.A., M.R.A.S., Government College, Ajmere, India.
- SARGENT, D. A., M.D., Hemenway Gymnasium, Harvard University, Cambridge, Mass.
- SARTELLE, EDWARD JAMES, Esq., State Mutual Life Assurance Company, Worcester, Mass.
- SCAIFE, WALTER B., Ph.D., 143 North Avenue, Allegheny, Pa.
- SCHLESINGER, BARTHOLO, Esq., Brookline, Mass.
- SCHWAB, J. C., Ph.D., Yale University, New Haven, Conn.
- SEAUER, EDWIN P., LL.B., Superintendent of Schools, Boston; address, Newton Highlands, Mass.
- SEAUER, DR. JAY W., Yale University, New Haven, Conn.
- SEDGWICK, PROF. W. T., Ph.D., Institute of Technology, Boston, Mass.
- SELIGMAN, PROF. E. R. A., LL.B., Ph.D., Columbia College, New York.
- SELIGMAN, ISAAC N., Esq., 58 West 54th Street, New York.
- SHATTUCK, GEORGE C., M.D., 6 Newbury Street, Boston, Mass.
- SHAW, ALBERT, Ph.D., Editor *Review of Reviews*, New York.
- SHEARMAN, THOMAS G., Esq., 45 Willam St., New York. Life Member.

- SOUTHER, CHARLES EDWARD, Esq., 120 Broadway, New York.
- SPALDING, WARREN F., Esq., Massachusetts Prison Association, 1 Pemberton Square, Boston, Mass.
- SPAULDING, H. C., Esq., Thomson Houston Co., 620 Atlantic Avenue, Boston, Mass.
- SPEIR, FRANCIS, JR., Esq., 58 Wall Street, New York.
- STANWOOD, EDWARD, A.M., *Youth's Companion*, Boston, Mass.
- STERNE, SIMON, Esq., 141 West 118th Street, New York.
- STEVENS, ALBERT C., Esq., *Bradstreet's*, New York.
- STEWART, ETHELBERG, Esq., Dept. of Labor, Washington.
- STICKNEY, MATTHEW, Esq., Salem, Mass.
- STRONG, REV. JOSIAH, General Secretary of the Evangelical Alliance, 42 Bible House, New York.
- SWAIN, PROF. GEORGE F., S.B., Institute of Technology, Boston, Mass.
- SWANK, JAMES M., Esq., General Manager American Iron and Steel Association, 261 South Fourth Street, Philadelphia, Pa.
- TALCOTT, JOHN B., Esq., New Britain, Conn.
- TATLOCK, JOHN, JR., Esq., Asst. Actuary, Mutual Life Insurance Co., New York.
- TAUSSIG, PROF. FRANK W., PH.D., Harvard University, Cambridge, Mass.
- TAYLOR, PROF. GRAHAM, Theological Seminary, Hartford, Conn.
- THURBER, FRANCIS B., Esq., New York.
- THURBER, WILLIAM B., S.B., Plymouth, Mass.
- TILESTON, JOHN B., Esq., Mattapan, Mass.
- TRACY, ROGER S., Esq., 301 Mott Street, New York.
- TRASK, WILLIAM BLAKE, Esq., 18 Somerset Street, Boston, Mass.
- TREE, HON. LAMBERT, 70 LaSalle Street, Chicago, Ill.
- TUCKER, GEO. F., Esq., 76 Equitable Building, Boston, Mass.
- TUCKER, PROF. WILLIAM J., Theological Seminary, Andover, Mass.
- TURRELL, HON. O. B., Redwood Falls, Minn.
- VILLARD, HENRY, Esq., Mills Building, New York.
- WADLIN, HON. HORACE G., Bureau of Statistics, Boston, Mass.
- WADSWORTH, H. L., Esq., *Mining and Scientific Review*, Denver, Col.
- WAITE, HENRY RANDALL, PH.D., 120 Broadway, New York.
- WALKER, GEN. FRANCIS A., PH.D., LL.D., Institute of Technology, Boston, Mass.
- WALKER, MRS. HARRIET G., 803 Hennepin Ave., Minneapolis, Minn.
- WALKER, PROF. WILLISTON, PH.D., Theological Seminary, Hartford, Conn.
- WARNER, PROF. AMOS G., PH.D., Supt. of Charities, Washington.
- WARNER, HON. A. J., Marietta, Ohio.
- WARNER, B. H., Esq., President Loan and Trust Co., Cor. 10th and F Streets, Washington.
- WATERSTON, REV. ROBERT C., 71 Chester Square, Boston, Mass. Life Member.
- WATSON, MISS CARRIE M., Librarian University of Kansas, Lawrence, Kansas.
- WEBSTER, FRANKLIN, Esq., *The Chronicle*, 83 Pine St., New York.

- WEEKS, JOSEPH D., Esq., Editor *Iron Age*, Box 1059, Pittsburg, Pa.
WEEKS, RUFUS W., Esq., 346 Broadway, New York.
WELLS, PROF. D. COLLIN, Bowdoin College, Brunswick, Me.
WEISSINGER, HARRY, Esq., Floyd-Street, Louisville, Ky.
WEY, H. D., M.D., 859 Main Street, Elmira, N. Y.
WHEATLAND, HENRY, M.D., Salem, Mass.
WHEELER, A. S., Esq., Sears Building, Boston, Mass.
WHEELRIGHT, HON. HENRY B., Newburyport, Mass. Life Member.
WHITE, HORACE, Esq., 51 E. 55th Street, New York.
WHITE, JULIAN LEROY, Esq., 18 Mt. Vernon Place W, Baltimore, Md.
WHITEHEAD, MORTIMER, Esq., 1618 Q Street, N. W., Washington.
WHITMAN, WILLIAM, Esq., President National Association of Woollen Manufacturers, Brookline, Mass.
WHITMORE, WILLIAM H., A.M., 55 Kilby Street, Boston, Mass.
WHITRIDGE, F. W., Esq., 59 Wall Street, New York.
WILLARD, CYRUS F., Esq., *The Globe*, Boston, Mass.
WILLCUTT, LEVI, Esq., President New England Felt Roofing Co., 22 Milk Street, Boston, Mass.
WILLIAMS, EDWARD H., JR, Esq., 117 Church Street, Bethlehem, Pa.
WILLIAMS, GEORGE FRED, Esq., 209 Washington Street, Boston, Mass.
WILLIAMS, F. R., Esq., Division of Manufactures, Census Office, Washington.
WILLIAMSON, JAMES F., Esq., 27 Fourth Street, So., Minneapolis, Minn.
WILSON, GEORGE, Esq., Secretary of Chamber of Commerce, New York.
WINES, REV. FREDERICK H., Secretary National Prison Association, Springfield, Ill.
WOOD, MISS M. ANNA, Wellesley College, Wellesley, Mass.
WOOD, STUART, PH.D., 1620 Locust Street, Philadelphia, Pa.
WOODRUFF, CLINTON ROGERS, Esq., *The National Baptist*, 1420 Chestnut Street, Philadelphia, Pa.
WOODWARD, PROF. C. M., Washington University, St. Louis, Mo.
WORTHINGTON, THOMAS K., PH.D., 301 N. Charles Street, Baltimore, Md.
WRIGHT, HON. CARROLL D., Department of Labor, Washington.
WRIGHT, WALTER C., Esq., Actuary New England Mutual Life Insurance Co., 87 Milk Street, Boston, Mass. Life Member.

is \$8, with 50 per cent of the class on either side, so that \$8.50 represents not only the class where the median is found, but also the place in its class.

In like manner the median for amount of wealth in Type 1 is mathematically placed where 52.63 of the wealth in the class of owners possessing \$9 each is on the poorer side of the median and where 11.63 is on the richer side.

The pair of medians for each of the five types will be found in the table of "Measures of Distribution," and also the differences between them; the larger the difference the greater being the inequality of distribution. A comparison of these differences reduces the five types of arrangement to three distinct degrees of inequality of distribution, and suggests a further examination of the five arrangements. It will now be noticed that, while there are five types of arrangement, there are but three distinct degrees of distribution, owing to the fact that, the columns for number and amount both being taken into consideration, Types 1 and 2 are almost alike, and that the same is true of Types 3 and 4. There is a massing of number and amount in very nearly the same region in each of Types 1 and 2. The massing of number in Type 3 and of amount in Type 4 is at one end of the scale, while the median for amount in Type 3 and for number in Type 4 is the same. In Type 5 the massing of the number of wealth owners at the two extremes of the scale necessarily masses the wealth at the richer extreme and makes a distinct degree of distribution, which is the most unequal of all, because the two masses of number of owners balance each other at the middle of the scale, and do not permit their resultant median to approach the greater mass of wealth found at the richer end of the scale in the column for amount.

The smaller the number representing the measure the more even the distribution. Therefore, in a group of wealth owners the more even distribution is found if the middle class is more prominent than the poorer class on one side and the richer class on the other, or if the richer class is more promi-

nent than the middle class and the latter is more prominent than the poorer class. The more unequal distribution is found if the richer and poorer classes are each more prominent than the middle class. An intermediate degree of distribution is found if the poorer class is more prominent than the middle class and that is more prominent than the richer class, or if the three classes have no prominence over one another.

It may be supposed that the wealth owners of Massachusetts do not approximately fall into the arrangement of Type 5, nor of Type 4, nor of Type 2, nor of Type 1; until statistics shall decide, it is probable that they are represented by some variation of Type 3, the degree of this type's distribution not being distinctively even nor uneven.

Having determined the proportions of owners of wealth and non-owners in a social group, and the degree of evenness or unevenness with which wealth is distributed among the owners, we need to determine what the character of the distribution is in still another respect. Two social groups may have substantially the same proportion of wealth owners among whom wealth is distributed with substantially the same evenness, and yet the relationship of the owners to their wealth may be widely different in the two cases. The people of North Dakota and the people of New York would be insufficiently compared with each other in an important particular if we were to stop here. The relationship of the owners, as a mass, to their wealth, as a mass, has not yet been touched. North Dakota is poorer than New York; wealth is more abundant in New York, no matter whether owned by a smaller proportion of the people, nor whether more unequally distributed among its owners than in North Dakota. The general level of distribution is higher in New York than in the other state; there is more wealth in relation to the number of its owners.

It remains for the average to find the general level, or plane, of distribution. By no other course can the relation-

ship of mass to mass be represented comprehensively, nor by one number. The average amount of wealth possessed by each owner does not imply that anyone owns the average, nor that a majority, nor any considerable proportion of the owners individually, own wealth near the average in amount. These conclusions may be confirmed or denied analytically by a classification of owners according to the amount of their holdings. It is now necessary to avoid analysis altogether, and to grasp a generality in which rich and poor are individually lost to sight. Nothing but the average answers this purpose.

Since the preceding tables are purely illustrative, the average holdings and imaginary percentages of owners of population have been added merely to complete the formal statement.

Social groups may now be fully compared with one another in regard to distribution, except so far as analysis may be desired. In comparing two groups the statement may be that in one of them a larger proportion of the people own wealth, and that it is more evenly distributed among its owners on a higher plane of distribution. According to general belief, this would be giving to a community a most desired character in regard to the distribution of wealth. For comparative purposes the three descriptions of distribution become six; the proportion of the wealth owners in the population, and the evenness or inequality of the distribution of their wealth among them may be more or less, and the plane on which the distribution takes place may be higher or lower in one social group than in another, or at one time in the same social group than at another. These six comparative descriptions, always to be used in combinations of the three essentials, admit of eight combinations.

An application of this triple measure of distribution may be made to the ownership of government bonds, statistics of which were published by the United States Census of 1880.¹

¹ Vol. VII, pp. 498-501.

Massachusetts and Maryland are selected for the following table as representing distinctly different results:—

TABLE III.
NUMBER AND AMOUNT OF FOUR, FOUR AND ONE-HALF, AND FIVE PER CENT REGISTERED GOVERNMENT BONDS OWNED IN MARYLAND AND MASSACHUSETTS IN 1880.

MARYLAND.

Classification of Holdings.	Total.		For Males.		For Females.	
	Number of Owners.	Amount Owned.	Number of Owners.	Amount Owned.	Number of Owners.	Amount Owned.
\$500 and under ...	227	\$70,700	111	\$33,250	116	\$37,450
550 to \$1,000	189	173,800	110	101,050	79	72,750
1,050 to 2,500	174	309,450	103	186,150	71	123,300
2,550 to 5,000	122	471,100	82	316,750	40	154,350
5,050 to 10,000 ...	98	797,300	60	503,800	38	293,500
10,050 to 25,000 ...	63	1,030,400	44	782,800	19	307,600
25,050 to 50,000 ...	27	1,011,250	17	632,550	10	378,700
Over \$50,000.....	20	3,065,600	15	2,559,300	5	726,300
Total	920	\$6,989,600	542	\$4,895,650	378	\$2,093,950

MASSACHUSETTS.

\$500 and under ...	7,244	\$2,060,350	3,526	\$1,029,450	3,718	\$1,030,900
550 to \$1,000	3,759	3,317,450	2,002	1,782,750	1,757	1,534,700
1,050 to 2,500	2,784	4,888,650	1,540	2,725,050	1,244	2,163,600
2,550 to 5,000	1,592	6,131,200	1,030	3,985,700	562	2,145,500
5,050 to 10,000	814	6,311,950	553	4,278,600	261	2,033,350
10,050 to 25,000	444	7,260,850	294	4,890,700	150	2,380,150
25,050 to 50,000	137	6,026,800	117	4,561,400	20	1,465,400
Over \$50,000.....	81	9,141,500	73	8,504,200	8	637,300
Total	16,855	\$45,138,750	9,135	\$31,747,850	7,720	\$13,390,900

After treating these statistics in accordance with the method of measuring distribution described on the preceding pages, it appears that in Maryland 0.10 of 1 per cent of the total population, 0.12 of 1 per cent of the male population, and 0.08 of 1 per cent of the female population owned registered government bonds bearing the rates of interest mentioned in 1880; and that in Massachusetts 0.95 of 1 per cent of the total population, 1.06 per cent of the male population,

TABLE IV.
MEASURES OF DISTRIBUTION OF GOVERNMENT BONDS.

Description.	Total.	For Males.	For Females.
MARYLAND — median for amount.....	\$39,411	\$45,719	\$28,872
“ “ “ number.....	1,417	1,754	966
Difference.....	37,994	43,965	27,906
MASSACHUSETTS — median for amount.....	\$9,890	\$16,398	\$4,795
“ “ “ number.....	692	784	586
Difference.....	9,198	15,614	4,209
MARYLAND — percentage of owners of population	0.10	0.12	0.08
MASSACHUSETTS “ “ “ “ “	0.95	1.06	0.83
MARYLAND — average holding.....	\$7,597	\$9,033	\$5,540
MASSACHUSETTS “ “	2,678	3,475	1,735

and 0.83 of 1 per cent of the female population owned bonds. The difference between the medians for total number of owners and amount of holdings in Maryland is \$37,994; for males, \$43,965; for females, \$27,906. The difference for the total in Massachusetts is \$9,198; for males, \$15,614; for females, \$4,209. The average holding in Maryland was \$7,597; for males, \$9,033; for females, \$5,540. In Massachusetts the average holding was \$2,678; for males, \$3,475; for females, \$1,735.

The sexes may now be compared thus: A larger proportion of the male population than of the female population owned bonds in each state; the distribution of the amount of the bonds was more unequal among the male owners in each state than among the female owners; and the general level, or plane, of the distribution in each state was higher among the males than among the females.

In comparing the states it may be said that much larger proportions of both male and female populations owned bonds in Massachusetts than in Maryland; that the distribution was much more even for each sex in Massachusetts than in Mary-

land; and that the plane of the distribution was much higher in Maryland than in Massachusetts for each sex.

It is admitted that the medians are not accurately placed in the preceding table, because the class of bond holders in which each median is placed (\$10,050 to \$25,000, for instance) may include holdings of too wide a range in amount, and because these holdings may be unequally distributed throughout the class. There may be more holdings of \$20,000 than of \$13,000, and, if this is so, the apparent place of a median in this class is not the true place. However, these errors are probably more or less of a related character, which diminishes their effect in a comparison of the medians, since in such case the errors must tend to cancel each other; and, besides, the difference between any two medians is probably too great to be accounted for entirely by an error due to the too limited classification employed by the Census Office. An error of this sort is the fault of the tables, of course, and not of the process adopted for measuring the inequality of distribution; the classification could have been made as minute as the holdings allow, and the matter is referred to for the purpose of pointing out the minuteness of the classification required by this process of arriving at the measure.

Extra Census Bulletin No. 18 publishes statistics showing the values of mortgaged farms and homes occupied by owners in 10 counties in Kansas and 10 counties in Ohio, and the distribution of these values may be measured by the scheme herein described. The classification of values is not minute enough to insure positive accuracy in computing the places of the medians, but is sufficiently minute to establish true comparisons among them as indicating relative evenness or inequality of distribution. The comparisons would probably be changed only in degree if the classification were minute enough to permit the location of the medians with precision.

The following comparisons of the distribution of the values of mortgaged farms and homes occupied by owners in the

TABLE V.

DISTRIBUTION OF THE VALUES OF MORTGAGED FARMS AND HOMES OCCUPIED BY OWNERS.

10 Kansas Counties.

Classification of Values.	For Farms.		For Homes.	
	Number of Families.	Value of Farms.	Number of Families.	Value of Homes.
Under \$100 .....	.....	.....	2	\$150
\$100 and under \$200	3	\$445	13	1,842
200 and under 300	7	1,535	28	6,185
300 and under 400	16	5,120	55	17,320
400 and under 500	28	11,340	86	35,125
500 and under 1,000	252	183,363	577	390,675
1,000 and under 1,500	601	690,606	444	491,925
1,500 and under 2,000	861	1,390,611	305	484,266
2,000 and under 2,500	968	2,001,848	199	405,850
2,500 and under 5,000	3,244	10,819,498	453	1,424,664
5,000 and under 10,000	1,224	7,670,806	158	989,150
10,000 and under 25,000	321	4,224,200	63	869,100
25,000 and over	28	904,800	4	130,000
Total	7,553	\$27,904,172	2,387	\$5,246,252

10 Ohio Counties.

Classification of Values.	For Farms.		For Homes.	
	Number of Families.	Value of Farms.	Number of Families.	Value of Homes.
Under \$100	1	\$98	9	\$520
\$100 and under \$200	22	3,037	40	5,643
200 and under 300	36	7,904	97	21,989
300 and under 400	73	23,146	133	42,526
400 and under 500	60	24,930	140	58,187
500 and under 1,000	375	259,781	946	654,391
1,000 and under 1,500	439	502,337	910	1,036,736
1,500 and under 2,000	332	540,457	853	1,391,153
2,000 and under 2,500	308	646,366	700	1,454,644
2,500 and under 5,000	968	3,276,351	1,785	5,868,917
5,000 and under 10,000	670	4,371,333	902	5,711,010
10,000 and under 25,000	238	3,177,151	297	3,984,295
25,000 and over	21	799,124	42	1,485,960
Total	3,543	\$13,632,015	6,854	\$21,706,971

selected counties in these two states may now be made: The mortgaged farms in each state, as compared with the mortgaged homes, are owned by the larger proportion of the total farm families, owning and hiring; and in the Kansas counties by the larger proportion of the farm owning families, but by

TABLE VI.
MEASURES OF DISTRIBUTION OF FARM AND HOME VALUES.

Description.	10 Kansas Counties.		10 Ohio Counties.	
	For Farms.	For Homes.	For Farms.	For Homes.
Median for amount.....	\$4,734	\$3,886	\$6,752	\$5,288
“ “ number.....	3,302	1,487	2,824	2,214
Difference.....	1,432	2,399	3,929	3,074
Percentage of these families of total families reporting..	42.98	21.20	12.78	6.62
Percentage of these families of total owning families reporting.....	64.38	41.19	20.32	21.82
Average value	\$3,694	\$2,198	\$3,848	\$3,167

the smaller proportion in the Ohio counties. In the Kansas counties the distribution of the farm values is more even than that of home values, but in the Ohio counties is more uneven. The general level of the distribution is higher for farms in both states.

A comparison of the states for farms discloses the fact that a much larger proportion of the total farm families occupy and own mortgaged farms in the Kansas counties than in the Ohio counties, and a much larger proportion, also, of the total farm owning families; and that the distribution of the values of owned and mortgaged farms among the owners is more even in Kansas than in Ohio, on a somewhat lower plane of distribution.

Families occupying owned and mortgaged homes are a larger proportion both of the total home families and of the total home owning families in Kansas than in Ohio; the distribution of the values of homes that are owned and mortgaged is more even in Kansas, and on a lower plane of distribution than in Ohio.

An application of the scheme to the measurement of the distribution of the salaries paid to the office employes of the Pension Office and of the Census Office is made in the fol-

lowing tables. The number of persons drawing each rate of annual compensation is found in the Register of the Department of the Interior for 1891. The total amount of the compensation of each class is obtained by multiplying the number of persons in the class by the rate. It would be better to have actual salary earnings instead of these estimated earnings based on salary rates; but, as a matter of fact, the estimates are close to the true earnings for one year from the summer of 1890 to the summer of 1891, during which time the number of persons in each class changed but little.

TABLE VII.

DISTRIBUTION OF SALARIES IN THE PENSION OFFICE AND IN THE CENSUS OFFICE.

Classification of Salaries.	Pension Office.		Census Office.	
	Number of Employees.	Amount of Salaries.	Number of Employees.	Amount of Salaries.
\$240	13	\$3,120	57	\$13,680
400	25	10,000	22	8,800
600	....	.....	263	157,800
660	24	15,840	....	.....
720	35	25,200	525	378,000
750	3	2,250	....	.....
840	30	25,200	3	2,520
900	186	167,400	755	679,500
1,000	336	336,000	311	311,000
1,200	458	549,600	158	189,600
1,400	524	733,600	29	40,600
1,600	96	156,800	19	30,400
1,800	126	226,800	9	16,200
1,825	....	.....	1	1,825
2,000	173	346,000	10	20,000
2,190	....	.....	15	32,850
2,250	2	4,500	....	.....
2,500	....	.....	2	5,000
3,000	1	3,000	....	.....
3,600	2	7,200	....	.....
5,000	1	5,000	....	.....
6,000	....	.....	1	6,000
Total.....	2,037	\$2,617,510	2,190	\$1,893,775

The distribution of salary earnings was more uneven in the Pension Office than in the Census Office, and was remark-

TABLE VIII.
MEASURES OF DISTRIBUTION OF SALARIES.

Description.	Pension Office.	Census Office.
Median for amount.....	\$1,400.24	\$900.57
“ “ number.....	1,200.80	900.29
Difference.....	199.44	0.28
Average salary.....	\$1,285	\$869

ably even in the latter, the medians for number and amount being found in the same class,—that of employes receiving \$900; but the plane of distribution was much lower in the Census Office, the average salary in this office being \$869, and the average in the Pension Office being \$1,285.

It may not be impossible to obtain the required facts in regard to the ownership of wealth, the distribution of which could be measured by the foregoing scheme. Some sort of accurate measure must be employed if it is ever to be determined satisfactorily whether “the rich are growing richer and the poor poorer,” or whether the rich are growing richer faster than the poor are, unless the difference in distribution between two dates is so marked that the tendency may be indicated by means of percentages. The scheme herein outlined is suitable for this purpose, it is believed, and is applicable to the measurement of the distribution of the values of real estate, of wage earnings, of cattle, of the shares of corporations, etc., so that comparisons may be established between dates, and among various social groups, with the finest precision.

The belief prevails that the society containing the larger proportion of middle class wealth owners is the more healthy and promising society, other conditions being the same. It is desired that the great mass of the people shall enjoy a high degree of comfort, if not of luxury also; that wealth shall not only be widely diffused among the members of society,

but generously diffused, so that welfare shall be the possession of the masses. The highest welfare of this character does not require the predominance of the middle class, because it is mathematically demonstrable that, other things being equal, social welfare, to the extent that it is derived from wealth, is greater in proportion as the middle class predominates over the poorer class, and the richer class over the middle class; and that the type of distribution next to be desired is that in which the middle class of wealth owners predominates the more over co-equal poorer and richer classes.

STATISTICS OF SUICIDES IN NEW ENGLAND.

BY DAVIS R. DEWEY, PH.D.

1. Sources and authorities for statistics.

As far as my inquiry has gone, I have never been able to find that there has been a study of the statistics of suicide of the group of New England states covering any considerable period of time. A partial analysis of the returns of Massachusetts has been frequently and intelligently made, notably so in the Registration Report of 1885, prepared under the editorial supervision of Dr. Frank Wells, but no attempt was even then made to compare these returns with those from other American communities. Few, indeed, of the states outside of New England have established a thorough system of registration of vital statistics, and consequently do not furnish data which warrant an extended or profitable analysis. Some of the large cities are an exception to this rule, but in these, if taken alone, the circumstances and conditions are abnormal, and do not afford a basis for a comparative study, except within very narrow limits.

In several of the New England states, on the other hand, the collection and publication of statistics of mortality has been pursued with increasing success for two or more decades, and now, with the exception of Maine, can be drawn upon for material.

Massachusetts entered upon the work of collecting and digesting statistics of births, deaths, and marriages in 1843, doubtless stimulated by the precedent which England had set in the issue of her first Registration Report in 1839. The returns were naturally imperfect; no reports whatever were made by 35 towns having a population of 76,654 (1840), or about 10 per cent of the total population of the state. In the first report, returns for suicides are given for counties,

months, and ages, but sex is omitted. This latter significant element was not included until the Fourth Report, in 1845. Another addition was also made at that time in including the place of birth of the deceased, a question, however, dropped in 1850. From this time on there is little change in the returns of suicide until 1885. In that year a law was enacted requiring returns of all violent deaths to be made to the Secretary of State by officers known as Medical Examiners, as well as through the customary local registration machinery. In this way the returns of suicides, and in fact of all violent deaths, are duplicated, but in making the special examination of the circumstances attending the death the Medical Examiners endeavor to secure additional data which had previously escaped registration. Since 1884, therefore, we are acquainted with the method of suicide.

In connection with the reports made by Medical Examiners an important question arises as to the completeness and accuracy of the returns of suicide given in the ordinary way, through certification by the attending physician to the local authority, and the subsequent transmission of this information to the state officials. It will be observed that the returns of the Medical Examiners are larger than those given in the body of the Registration Reports. This is seen from the following figures: —

	Registration.	Medical Examiners.
1885	176	181
1886	149	157
1887	165	173
1888	164	190
1889	175	199
	<hr/> 829	<hr/> 900

The Medical Examiners thus find about eight per cent more suicides than those detected by the usual methods, which alone have been relied upon during the greater part of the history of registration in this state.

In preparing Table I, showing the total number of suicides, I have followed, somewhat arbitrarily it is to be confessed,

the registration returns, not that they are regarded as more accurate, but because it does not appear to be fair to compare the returns of Medical Examiners with those collected by a different method previous to 1885. If eight per cent is lost now, it is highly probable, considering the long uniform excellence of the administration of health and vital statistics in Massachusetts, that the same percentage was lost in the earlier period. The adoption of the more complete returns for purposes of comparison would give an exaggerated increase for the past few years.

It is also to be observed that, from a statistical point of view, the loss of eight per cent in the returns of suicides is not a serious error for the treatment of most of the topics connected with this subject. It is not probable that the calculations as to sex, time of year in which the suicide was committed, or age will be affected by the escape of this fractional part. Calculations as to the method by which self-destruction was accomplished are undoubtedly affected by a deficiency in the returns, for only those cases in which the act was committed by some secret and non-public method would go undetected and unreported. For Massachusetts, however, there are no returns of method for the state at large, save those given by the Medical Examiners since 1884, and consequently there is no need for concern in the treatment of this particular inquiry.

The first Registration Report of Rhode Island was issued in 1853, when the time of year, age, sex, county, and occupation was reported for the two suicides which came under observation. Connecticut published her first Report in 1848, but the nosological arrangement was not adopted until the second Report. Connecticut has also, until lately, been defective as to certain important inquiries. No distinction whatever is anywhere made for a portion of the period as to sex of suicides, and consequently for all the larger calculations into which sex enters as a factor this state is omitted from consideration. Vermont began the work of registration

in 1857, but the returns for the first few years are manifestly so imperfect that no attempt has been made to include them within the scope of this study. The arrangement of data is practically similar to that of Massachusetts. New Hampshire has been one of the most recent states to fall into line, and though there are returns for some years previous to 1883, it has not been thought advisable to place reliance upon them. Maine as yet has no state system of registration, a lapse from sound administrative policy which, it is hoped, will soon be remedied. The authorities for the present treatment are therefore found in the Registration Reports of Massachusetts, 1850-1889; Connecticut, 1856-1889; Rhode Island, 1856-1889; Vermont, 1866-1889; and New Hampshire, 1883-1889. The total number of suicides recorded in these states for the periods named amounts to about 6500, a number sufficiently large to encourage an analytic treatment.

2. Number of suicides.

Table I, which follows, presents the number of suicides in the several states referred to, and Table II corrects the comparison by taking into account the changes in the populations of the respective states, and gives the rate per million of inhabitants. The chief point of interest in this table is the decline in the number during the period of the Civil War in Massachusetts and Connecticut, and the steady increase in the rate since that period in those two states, while the others do not present the same regularity. The rate was low during the civil war and the years immediately succeeding that period, as might be expected from a study of similar occurrences in Europe. It is perhaps worthy of notice that the panic year of 1873 did not witness any increase in suicide,—in fact, the rate both in that year and the next was generally low in all the states considered.

TABLE I.
NUMBER OF SUICIDES IN THE NEW ENGLAND STATES (MAINE EXCEPTED), WITH
AVERAGES OF PERIODS OF FIVE YEARS.

Periods and Years.	Massachu- setts.	Connecticut.	Rhode Island.	Vermont.	New Hampshire.
1850	49	....	....	....	....
1851	57	....	....	....	....
1852	76	....	....	....	....
1853	67	....	....	....	....
1854	82	....	....	....	....
1855	91	....	....	....	....
Average, 1851-55	74.6	....	....	....	....
1856	101	20	4	....	....
1857	97	28	8	....	....
1858	82	30	13	....	....
1859	83	25	9	....	....
1860	113	31	12	....	....
Average, 1856-60	95.2	26.8	9.2	...	....
1861	92	31	12	....	....
1862	92	28	8	....	....
1863	67	15	13	....	....
1864	65	19	6	....	....
1865	78	17	12	....	....
Average, 1861-65	78.8	22	10.2	....	....
1866	73	39	11	20	....
1867	75	25	15	24	....
1868	88	20	18	27	....
1869	92	29	15	30	....
1870	91	27	27	23	....
Average, 1866-70	83.8	26	17.2	24.8	....
1871	122	43	19	30	....
1872	117	36	18	25	....
1873	117	24	8	27	....
1874	115	32	18	16	....
1875	159	51	26	27	....
Average, 1871-75	126	37.2	19.8	25	....
1876	119	39	18	31	....
1877	163	52	22	32	....
1878	126	58	21	30	....
1879	161	66	13	27	....
1880	133	48	10	30	....
Average, 1876-80	140.4	52.2	16.8	30	....
1881	165	69	23	30	....
1882	162	65	31	25	....
1883	167	60	24	23	31
1884	184	65	22	28	37
1885	176	81	20	38	33
Average, 1881-85	170.8	68	24	29.8	....
1886	149	80	17	37	28
1887	165	92	16	25	33
1888	164	95	21	33	31
1889	175	80	....	22	29

TABLE II.
PROPORTION OF SUICIDES PER MILLION OF INHABITANTS.

Year.	Massachu- setts.	Connecticut.	Rhode Island.	Vermont.	New Hamp- shire.
1851	55.8	....	..	....	....
1852	72.5	....	..	....	....
1853	62.3	....	....	....	....
1854	74.3	....	....	....	....
1855	80.4	....	....	....	....
Average, 1851-55	69.0	....	....	....	....
1856	87.7	47.4	24.5	....	..
1857	82.9	65.0	48.2	....	....
1858	68.6	68.0	77.0	....	....
1859	68.6	55.5	52.6	....	....
1860	91.8	67.3	68.7	....	....
Average, 1856-60	79.0	60.6	54.2	....	....
1861	74.3	66.3	68.0	....	....
1862	73.8	59.0	44.8	....	....
1863	53.5	31.1	72.0	....	....
1864	51.6	38.8	32.8	....	....
1865	61.5	34.4	64.8	....	....
Average, 1861-65	62.9	45.9	56.5	...	....
1866	56.0	77.0	57.5	61.4	....
1867	55.9	48.7	76.0	73.6	....
1868	63.8	38.4	88.4	86.5	....
1869	64.9	58.8	71.3	91.1	....
1870	62.4	50.2	124.2	69.5	....
Average, 1866-70	60.6	54.0	83.5	76.2	....
1871	81.6	79.0	84.4	90.6	....
1872	76.3	65.1	77.2	75.5	....
1873	74.4	42.7	33.2	81.5	....
1874	71.3	56.1	72.1	45.3	....
1875	96.3	88.2	100.8	81.5	....
Average, 1871-75	80.0	66.2	73.5	74.9	....
1876	70.9	66.4	68.7	93.6	....
1877	95.7	87.2	82.9	96.5	....
1878	72.8	96.0	78.0	90.3	....
1879	91.6	107.6	47.7	81.3	....
1880	74.5	77.0	36.2	90.3	....
Average, 1876-80	81.1	86.6	62.7	90.4	....
1881	90.9	108.8	81.5	90.3	....
1882	87.8	100.8	108.0	75.3	....
1883	88.9	91.3	81.9	69.2	87.2
1884	96.3	97.1	73.7	84.3	104.2
1885	90.6	118.7	65.7	114.4	92.1
Average, 1881-85	90.9	103.3	82.1	86.7	....
1886	74.5	115.2	54.4	111.4	76.8
1887	80.2	130.1	50.0	75.3	89.7
1888	77.5	132.0	63.9	98.4	83.7
1889	80.4	109.1	....	66.2	77.6

The estimates for population in intercensal years are obtained by applying the customary formula for calculating the geometrical increase of the population : $\sqrt[n]{\frac{p}{p^1}} = r$ in which p

denotes the population at a given census and p^1 the population at a previous census, and n the number of the intervening years. It is unfortunate that in most of the American Registration Reports the compilers and editors have been content with the arithmetical rate of increase instead of the geometrical rate in computing intercensal populations. In some instances, where the population is increasing rapidly and the census is not taken oftener than once in ten years, a considerable error is introduced which ought to be avoided.

From Table II it is clearly seen that the suicidal tendency has been steadily increasing in the last twenty years in Massachusetts and Connecticut; that in Vermont there has been a general advance, not however so regular, while in Rhode Island no marked tendency in any one direction can be discerned. Taking New England as a whole, it seems probable from the data presented that suicides have increased from thirty to forty per cent since 1860. In Connecticut the advance in the rate has been very marked in the past ten years, disclosing an amount which it is difficult to parallel in English-speaking countries.

It is not possible, as far as my examination goes, to show that there is any great difference in the rate from a geographical point of view. In the several quinquennial periods since 1850 Massachusetts has held the maximum rate on three occasions; Connecticut on one; Rhode Island on one; and Vermont on one. On the other hand, in the twenty-three separate years considered individually, 1866–1888, Connecticut bears the palm for ten of the years; Rhode Island for seven; and Vermont for six. The fluctuations are much more variable in the three smaller states than in Massachusetts.

3. Sex of suicides.

For the consideration of sex relations there are grouped together 6473 cases, tabulated in Table III. In all of the states under consideration a distinction is made for sex for some portion of the period analyzed. Connecticut and New Hampshire are not so complete in these returns, but the reports of the others are uniform and satisfactory.

The proportions of males of the whole number for the several states are substantially identical,—75.1 and 77.1 being the extremes. The range of fluctuation during the several periods is slight. In Massachusetts the limits are 70.4 and 81.7 per cent, and in Vermont the maximum and the minimum ratio are almost identical with those of Massachusetts. These ratios do not differ materially from those observed in Euro-

TABLE III. DISTRIBUTION OF SUICIDES IN NEW ENGLAND STATES ACCORDING TO SEX.

Periods.	Massachu- setts.		Rhode Island.		Vermont.		New Hampshire.		Connecti- cut. ³		Total.		Percentage of Males.				Total.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	Mass.	R. I.	Vt.	N. H.		Conn.
1851-55	262	110	....	....	....	....	....	....	....	....	262	110	70.4	....	....	....	....	70.4
1856-60	361	115	....	....	....	....	....	....	....	....	361	115	75.8	....	....	....	....	75.8
1861-65	295	99	....	....	....	....	....	....	....	....	295	99	74.8	....	....	....	....	74.8
1866-70	323	96	65	21	100	24	....	....	....	....	488	141	77.0	75.5	80.6	....	....	77.6
1871-75	496	133	61	28	98	27	....	....	....	....	657	187	79.0	68.5	78.4	....	....	77.8
1876-80	574	128	62	22	111	39	....	....	....	....	747	189	81.7	73.8	73.3	....	....	79.7
1881-85	660	194	96	24	103	41	....	....	....	....	858	259	77.2	79.8	71.5	....	....	76.7
1886-89 ¹	500	153	49 ²	5 ²	79	32	93	28	276	70	969	272	76.5	92.5	71.2	76.8	79.7	78.0
Total.	3,473	1,027	332	100	491	163	93	28	579 ⁴	177 ⁴	4,978	1,496	77.1	76.8	75.1	76.8	76.6 ⁴	76.9

¹ For four years only. ² For three years only, 1886-88.³ For 1878-84: males, 303; females, 107. Per cent of males, 73.9. Returns of sex are not given for Connecticut previous to 1878, or for 1885.⁴ Including returns as given in Note 3.

pean countries. In the table prepared by Morselli,* showing the influence of sex on suicide, where 56 percentages are calculated for various periods between 1830 and 1876 for nearly a score of countries, 30 of the male percentages fall between 70 and 80 per cent. Prussia, Belgium, Austria, Italy, and some of the smaller German states have a higher ratio for males, 80 or more. The percentages of the New England states accord more closely with those of Norway, Denmark, France, and England than with those of the central European states. Upon this section it only needs to be added that the balance between males and females in the total population in the several states, with the exception of Massachusetts and Rhode Island, is almost even, and that in these two exceptions the distribution is in favor of the female sex, particularly during the latter portion of the period. A strictly accurate adjustment would, therefore, slightly increase the ratios calculated for males in these states.

4. Suicides according to age.

Tables IV-V present the distribution of suicides according to age, and are based upon 6763 cases. Of these nearly two-thirds belong to Massachusetts. In all the states, except Connecticut, the classification is made for five-year periods by sex up to 20 years of age, and for decennial periods after that year to 80. In Connecticut no distinction is made for sex in the age distribution, and for some unaccountable reason, and obviously by error, some eighteen cases are reported as under ten years of age. Table IV shows the absolute number of suicides in the several age periods; Table V the same facts calculated in percentages for ease of comparison; and Table VI the number of suicides in Massachusetts for each age compared with the total population of similar age. The latter is clearly the most satisfactory treatment of the age element, and I regret that I have not had opportunity to make similar calculations for all the states for

* *Suicide*. American Edition, p. 190.

TABLE IV.
DISTRIBUTION OF SUICIDES ACCORDING TO AGE.

Age Periods.	Massachusetts, 1850-89.			Connecticut, 1878-89.	Rhode Island, 1855-89.			Vermont, 1866-89.			New Hamp- shire, 1883-89.			Total, Excluding Connecticut.		Grand Total.
	M.	F.	Total.		M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	
0-10	.....	.....	.....	18	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	18
10-15	14	1	15	33	1	.....	1	5	.....	5	2	.....	2	22	1	26 ¹
15-20	72	69	141		9	7	16	17	8	25	5	4	9	103	88	221 ¹
20-30	545	229	774	122	61	30	91	74	32	106	17	5	22	697	296	1115
30-40	619	217	836	138	55	31	86	72	30	102	21	6	27	767	284	1189
40-50	700	203	903	167	95	26	121	65	24	89	20	5	25	880	258	1305
50-60	701	140	841	180	105	21	126	98	35	133	36	11	47	940	207	1327
60-70	501	125	626	92	62	13	75	86	20	106	38	8	46	687	166	945
70-80	271	46	317	65	27	5	32	54	11	56	21	2	23	373	64	502
Over 80	48	8	56	21	10	...	10	15	4	19	4	5	9	77	17	115
Total.	3471	1038	4509	836	425	133	558	486	164	641	164	46	210	4546	1381	6763

¹ Of Connecticut's 33, 3 are credited to the period 10-15, and 30 to 15-20.

a longer period of time. It is popularly believed that the maximum tendency toward suicide is found in the earlier age periods, and this error is due to the fact that allowance is not made for the much larger population living in those earlier age periods, and the relatively small number of those living in the more advanced portion of life. The last table shows that the maximum tendency for males in Massachusetts falls in the age period 70-80, and weakens gradually as the preceding age periods are followed back in order. This is not only true for the averages of the two successive quinquennial periods of years, but is in the main true for the years taken individually, showing that the aberrations are not great. This maximum tendency is found in seven of the ten years in this age group of 70-80, and the exceptions are discovered in the neighboring groups on either side.

In the female sex there is not the same uniformity, probably because the data are not numerous enough to warrant a satisfactory generalization. During the first quinquennial period, 1876-1880, there is little difference in the three age

TABLE V.
DISTRIBUTION OF SUICIDES ACCORDING TO AGE IN PERCENTAGES.

Age Periods.	Massachusetts, 1860-89.			Connecticut, 1878-89.			Rhode Island, 1856-89.			Vermont, 1866-89.			New Hamp- shire, 1883-89.			Total, Excluding Connecticut.		Grand Total.
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	
0-10	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	.02
10-15	.04	....	.03	2.1	.02	.02	....	....	....	....	....	....	....	....	....	.5	....	.03
15-20	2.0	6.6	3.1	3.9	2.1	5.2	....	....	....	3.5	4.9	3.9	3.0	8.7	4.3	2.2	6.3	3.2
20-30	16.7	22.0	17.1	14.6	14.4	22.5	16.3	16.3	16.5	15.2	19.5	16.5	10.4	10.8	10.5	15.3	21.4	16.5
30-40	17.8	20.9	18.5	16.5	12.9	23.3	15.4	14.8	18.3	14.8	18.3	15.9	12.8	13.0	12.9	16.9	20.5	17.6
40-50	20.1	19.5	20.0	19.9	22.3	19.5	21.7	13.4	14.6	13.9	14.6	13.9	12.2	10.8	11.9	19.3	18.7	19.3
50-60	20.2	13.5	18.6	21.5	24.7	15.4	22.6	20.2	21.3	20.7	21.9	23.9	21.9	23.9	22.4	20.6	14.9	19.1
60-70	14.4	12.0	13.8	11.0	14.8	9.7	13.4	17.7	12.2	16.5	23.1	17.4	21.8	15.1	12.0	15.1	12.0	13.9
70-80	7.8	4.4	7.0	7.7	6.3	3.7	5.7	11.1	6.6	8.7	12.8	4.3	10.9	8.2	4.6	8.2	4.6	7.4
Over 80	1.3	.8	1.2	2.5	2.3	....	2.0	3.1	2.4	2.9	2.4	10.8	2.4	10.8	4.3	1.7	1.2	1.7
	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

groups between 30 and 60; in the second period the maximum falls in the group 60-70, and there is a steady decrease as the earlier groups are taken up. A more careful analysis further shows that the apparent irregularities are due to very abnormal rates for certain age groups in particular years, as, for example, in 1876 and 1877 there were no suicides between

60 and 70 years of age, exceptions to the rule found only twice in the whole record of suicides in Massachusetts since 1850. There is one point, however, wherein the two sexes differ in a marked way, and that is in the fact that the tendency to suicide is more evenly distributed all through life in the female than in the male sex. The tendency for males is from four to five times as great in the group 70-80 as in that of 20-30; in the female sex this tendency is not more than three times as great.

TABLE VI.

NUMBER OF SUICIDES IN MASSACHUSETTS, 1876-1885, FOR EACH AGE PERIOD COMPARED WITH THE TOTAL POPULATION OF SIMILAR AGE. RATES PER 1,000,000.

MALES.

	10-20.	20-30.	30-40.	40-50.	50-60.	60-70.	70-80.	Over 80.
1876	25.7	54	121	301	281	486	287	243
1877	12.6	173	144	295	400	433	805	470
1878	12.5	117	190	128	409	483	381	217
1879	5.2	153	129	230	492	516	579	208
1880	18.6	106	142	123	294	409	510	400
Average, 1876-80	14.9	121	145	215	375	465	512	308
1881	....	135	164	232	375	404	550	578
1882	11.8	113	198	198	283	486	585	....
1883	5.8	146	150	267	321	345	618	....
1884	11.4	97	161	249	509	404	700	350
1885	11.1	134	195	272	285	479	545	169
Average, 1881-85	8.0	125	174	244	355	424	600	219

FEMALES.

	10-20.	20-30.	30-40.	40-50.	50-60.	60-70.	70-80.	Over 80.
1876	6	64	23	31	46	0	45	0
1877	6	46	68	101	59	0	0	0
1878	0	11	37	19	29	44	43	0
1879	0	22	73	77	28	83	0	132
1880	6	43	50	28	94	63	81	0
Average, 1876-80	4	37	50	51	51	38	34	26
1881	6	43	50	93	39	204	39	0
1882	17	30	63	63	103	99	117	0
1883	6	41	48	53	88	136	76	113
1884	17	40	34	52	98	171	112	0
1885	16	45	81	43	60	19	36	0
Average, 1881-85	12	40	55	61	77	126	76	23

The other states of the New England section agree on the whole with Massachusetts in the maximum tendency in the age period 70-80. Table V shows that New Hampshire presents the only exception for males, and there the maximum is pushed on one decade in life. In females again there is less uniformity, this being particularly marked in Vermont and New Hampshire. If due allowance were made for population in age groups in these states it is probable that the rate would be found to be very high in the latter part of life.

A comparison of the rates per million of total population of similar age, as in Table VI, in Massachusetts with similar calculations made for other countries discloses some interesting results. It is unfortunate that England and Massachusetts do not use the same age grouping so as to make a strictly accurate comparison, but the substance of the differences can be detected from the following table, which gives rates for England and Wales for the period 1861-70:—

Age.	Males.	Females.
10-15	4	3
15-20	28	30
20-25	59	31
25-35	93	35
35-45	163	52
45-55	262	83
55-65	375	86
65-75	367	83
75-85	256	73
85 and over	204	50

In England the maximum rate is between the ages 55 and 65, with little difference between that and the next decade of life. There is the same regular decline in the earlier periods of existence. While the rates are higher in Massachusetts the ratios of increase are substantially the same. The maximum for females in England is also in the age period 55-65, and in this respect there is a greater similarity between the two sexes in England than in Massachusetts. In France the

highest rates for males is found in the age period 70-80, and the same is in the main true of the several countries considered in Table XXIX of the American edition of Morrell's work on suicide.

5. *Time of year.*

The distribution of suicides according to months is presented in Table VII, and the same data are distributed in proportions of 1000 in Table VIII. The tables are based upon 6788 cases. In the Connecticut Reports sex is not distinguished in the time of year of deaths by suicides, and consequently in several of the summaries, as indicated, this state is not included in the calculations.

TABLE VII.
DISTRIBUTION OF SUICIDES ACCORDING TO MONTHS.

Months.	Massachusetts, 1880-89.		Connecticut, 1875-89.	Rhode Island, 1885-89.		Vermont, 1886-89.		New Hampshire, 1883-89.		Total Males, Excluding Connecticut.	Total Females, Excluding Connecticut.	Grand Total Both Sexes, Including Connecticut.
	M.	F.		M.	F.	M.	F.	M.	F.			
January....	226	58	56	29	6	34	6	5	5	294	75	425
February...	213	61	46	21	7	27	12	9	5	270	85	401
March.....	306	95	66	32	8	39	14	13	2	390	119	575
April.....	368	110	84	45	17	41	8	21	4	475	139	698
May.....	345	94	81	38	16	55	19	20	4	458	133	672
June.....	334	100	85	42	15	51	9	17	6	444	130	659
July.....	305	113	97	40	14	39	22	19	2	403	151	651
August....	314	84	77	33	10	44	19	15	4	406	117	600
September.	274	87	55	34	12	38	17	13	3	359	119	533
October...	268	82	75	32	7	39	14	14	5	353	108	536
November..	261	86	61	29	10	43	14	12	2	345	112	518
December..	276	75	66	28	10	39	6	16	4	359	95	520
No. of Cases	3480	1045	849	403	132	489	160	174	46	4556	1383	6788

The suicidal mania for males reaches its maximum in April, while for females there are two maxima, July and April. If we combine the two sexes and include Connecticut, April claims the largest number. In the case of men the decline

TABLE VIII.

DISTRIBUTION OF SUICIDES ACCORDING TO MONTHS IN PROPORTION OF 1000.

Months.	Massachusetts.	Connecticut.	Rhode Island.	Vermont.	New Hampshire.	Males, Excluding Connecticut.	Females, Excluding Connecticut.	Grand Total.
January.....	62.8	65.9	65.4	61.6	45.4	64.5	54.2	62.6
February.....	60.4	54.2	52.3	60.1	63.6	59.2	61.4	59.1
March.....	88.4	77.7	74.8	81.6	68.2	85.6	86.0	84.7
April.....	105.4	98.9	115.9	75.5	113.6	104.4	100.5	102.5
May.....	96.9	95.3	100.9	114.0	109.1	100.5	96.1	98.9
June.....	95.7	100.1	106.5	92.4	104.5	97.4	93.9	97.1
July.....	92.1	114.4	100.9	93.9	95.4	88.4	109.2	95.9
August.....	87.7	90.7	80.4	97.1	86.3	89.1	84.6	88.3
September.....	79.6	64.8	85.9	84.7	72.7	78.8	86.0	78.5
October.....	77.1	88.3	72.9	81.6	86.3	77.4	78.1	78.9
November.....	76.5	71.8	72.9	87.8	63.6	75.7	80.9	76.3
December.....	77.4	77.7	71.0	60.3	90.9	78.8	68.6	76.6

from the April maximum is gradual, there being but a temporary halt in August and December. The minimum is delayed until February, but here the small proportion is undoubtedly due to the fact that this month is lean in days as compared with others. If the distribution could be reduced to a daily computation, it is highly probable that the minimum would be found in the first month of the year. Of the four states, Vermont is the only exception to the seasonal law which appears to hold. In that commonwealth the maximum for males is not touched until May, a month later than in the others. If, however, it be true that the suicidal tendency is intimately associated with temperature, and more particularly with the radical changes which nature displays in the spring of the year, with its revolutions in vegetable life, and in a less degree in animal life, it is natural that the maximum should be delayed in Vermont, where spring is more tardy in its coming. In New Hampshire too it will be observed that there are within one as many suicides of the male sex in May as in April.

For women the number of cases is not sufficiently large in

the smaller states to afford satisfactory generalizations. Vermont and Massachusetts are alike in showing the maximum in July, while April takes the lead in Rhode Island, and June in New Hampshire.

It is a notable difference that the suicidal maximum is found earlier in the year in our New England states than in European countries. According to the abundant material brought together by Morselli, "out of thirty-two periods belonging to seventeen European states, the maximum of suicides fell in June nineteen times; in May eight times; and in July five times only. The minimum in nineteen out of thirty-two times happened in December; seven in January; five in November; and only one in October." To sum up our own conditions in somewhat the same manner, the maximum of suicides in three states fell in April; in one in July; and in another in May. The minimum in all except New Hampshire is found in February, while in this one exception it is found in January.

6. Method of suicide.

The returns for determining the manner or method of suicide are by no means as satisfactory as those which have just been analyzed and tabulated. In Massachusetts there is no material of consequence until 1885, since which date, however, the returns are complete and almost beyond criticism. In New Hampshire and Vermont, the only other two states which pretend to make returns upon this point, the "otherwise" constitutes about one-half in the list of methods assigned. The following table shows the method of suicide in Massachusetts for the five years 1885-89.

Hanging is clearly the favorite method for men, and poison for women. The second choice of each sex is the favorite of the other. Women concentrate their attention practically upon three methods, poison, hanging, and drowning, while men add to their resources, "cutting the throat," and "fire-arms and other weapons." But few men leap from heights

TABLE IX.
METHODS OF SUICIDE IN MASSACHUSETTS, 1885-89.

	M.	F.	T.	Proportion of Males to 100 Females.	Each Sex in Percentages.	
Fire-arms and other weapons...	214	7	221	306	30.3	3.5
Cutting throats.....	71	8	78	887	10.1	4.1
Railroad.....	6	2	8	300	.8	1.0
Drowning.....	93	43	136	216	13.2	21.9
Hanging.....	154	44	199	350	21.8	22.4
Illuminating and other gases...	4	...	4	....	.6	....
Poisons.....	139	78	217	178	19.7	39.8
Leaps from heights.....	4	7	11	57	.6	3.5
Other.....	20	7	27	....	2.8	3.5
					100	100

as compared with women, and here the ratio is in favor of the latter sex in the proportion of 7 to 4. Among poisons arsenic is relied upon in more than one-half the cases of recent years. During the brief period of 1886-89, for which poisons are subdivided, the classification is as follows:—

TABLE X.
SUICIDE BY POISONS IN MASSACHUSETTS, 1886-89.

	Males.	Females.	Total.	Percentages.		
				Males.	Females.	Total.
Arsenic and its compounds	53	49	102	48	71	57
Opium and its compounds..	30	8	38	27	12	21
Other poisons.....	27	12	39	25	17	23
Total.....	110	69	179	100	100	100

Arsenic would appear to be used as an agency for self-destruction more by women than by men, the latter making employment of opiums and its compounds more frequently.

A reference to the returns of England shows that poison is employed twice as frequently in proportion to the total number in Massachusetts as in the mother country. Hanging, on the other hand, does not have as many votaries.

There are other relationships respecting the phenomenon of suicide upon which the returns of the New England states throw no light. We are defective in not recording the civil state, the occupation (save some unsatisfactory entries for Rhode Island), educational conditions, or nationality. The above tables, however, embrace the elements which are generally regarded as the most important for the study of this mysterious regular phenomenon of life.

SEMI-ANNUAL CENSUS OF PAUPERS IN MINNESOTA.

BY H. H. HART,

SECRETARY OF STATE BOARD OF CORRECTIONS AND CHARITIES, ST. PAUL.

The results of the semi-annual enumerations of paupers, taken in the state of Minnesota, are less complete and satisfactory than those of the prison population for obvious reasons; but they are sufficiently accurate to be of great value; and it is believed that with improved facilities the officials will be able to attain a close degree of accuracy.

The results of the United States census inquiry as to the number of paupers are confessed to be absolutely valueless, and this result is inevitable in the nature of things. When an enumerator goes from house to house, knocking at the door and inquiring "Are there any paupers living in this house?" it is easy to anticipate the answer. The only reliable source of information with reference to the pauper population is to be found in those who administer public relief. From this source a complete enumeration of single paupers and pauper families can be obtained.

In the state of Minnesota out-door relief is administered in sixty counties by the county commissioners (five in each county), who are ex-officio superintendents of the poor. In about twenty counties paupers are a charge upon the several townships, cities, and villages, and relief is administered by the township supervisors, or by the municipal councils.

The method pursued in our semi-annual enumeration is to send a blank to each one of these, the last of June or December, in the following form:—

JUNE 30, 1891.

DECEMBER 31, 1891.

TO THE COUNTY COMMISSIONERS.

GENTLEMEN:—We are anxious to obtain an accurate count of all paupers aided *during the past month* for the semi-annual State Pauper Census. Please fill out the following list of paupers for your district and return same without delay, and greatly oblige,

Yours respectfully,

H. H. HART, Secretary.

STATE PAUPER CENSUS.

JUNE, DECEMBER, 1891.

TO THE STATE BOARD OF CORRECTIONS AND CHARITIES.

The following is a list of the paupers aided in the.....
 commissioner's district of.....County, Minnesota, during the
 month ending June 30, December 31, 1891.

.....County Commissioner.

P. O. Address.....

N. B.— Include only paupers who received aid during the past month,
 and pensioners whose quarterly pension covers this month.

Name of pauper or head of family. Number of other members of family.
 Kind of relief given (cash, house rent, provisions, transportation, boarded
 out, etc.).

The blanks are accompanied by return postage. This necessitates
 correspondence with one thousand persons; most of them respond
 promptly on the last day of the month. To those who do not respond
 reminders are sent, in some cases two or three times. Failures to
 respond are usually from sparsely settled districts, where little or no
 relief has been given. In such cases the number of paupers is esti-
 mated by comparison with previous reports. The reports from the
 more populous counties and villages are usually very complete. When
 necessary, the entire results from counties are sent to the county
 auditor for revision and correction. Reports are also received from
 the almshouses, public hospitals, and private hospitals of the state of
 all paupers cared for at public expense.

The enumeration is taken in mid-summer and mid-winter, in order
 to compare the conditions at the extremes of the year. The results
 are disappointing. It was anticipated that the number of paupers in
 mid-winter would be greater than those in mid-summer; but, in fact
 (outside of the cities of St. Paul and Minneapolis), the total number
 of paupers in June, 1891, was 3865, and the total number in Decem-
 ber, 1891, was 3830, showing more paupers in June than in December.
 In the two cities, however, the results are different, showing 1574 in
 June and 2451 in December, an increase of nearly 60 per cent.

For convenience of comparison, the results are reduced to ratios,
 showing the number of inhabitants of the state to each pauper; but
 in future the ratio will probably be reversed so as to show the number
 of paupers in the thousand of the population.

The paupers are subdivided into the following classes : those boarded at public expense, those receiving "out-door relief" without board, and those receiving medical relief only.

The weak point of the enumeration is the number of individuals embraced in the families. In many cases the officers disbursing relief do not know the number of members of the families, and the number is therefore largely a matter of guess work. The average number of persons included in each "case" is 2.4. Probably the number of persons to each case should be somewhat larger than this, as in a considerable number of returns the number of members of the families is left blank, where the indications are that some members of the families should be included. This tendency to error is corrected, however, by the tendency to include self-supporting members of families in the pauper enumerations.

It is the intention, if legislation can be obtained, to establish a complete catalogue of paupers in the state, similar to that kept by some of the charity organization societies.

In my judgment, the only way in which a complete enumeration of paupers by the United States census could be obtained would be by correspondence with those who administer public out-door relief. It might be possible to conduct this correspondence in advance of the taking of the United States census. A list of the paupers in each district could then be furnished to the enumerators, who could be required to fill out detailed schedules with reference to these individuals.

A more satisfactory plan would probably be to designate those who administer public relief as special enumerators, and compensate them suitably for making the necessary returns. I believe there would be no serious difficulty in carrying out this plan ; and the expense need not be excessive.

REVIEWS AND NOTICES.

A STATISTICAL STUDY OF ILLEGITIMACY.

Illegitimacy, and the Influence of Seasons upon Conduct. Two studies in Demography. By Albert Leffingwell, M.D. With maps and diagrams. London and New York, 1892. Pp. viii, 160.

One of these studies forms "the first treatise in the English language upon the subject of Illegitimacy," while the other deals with the influence of seasons upon suicides, insanity, murder, crimes against chastity, crimes against the person, birth rates, marriage and divorce, and revolutions and insurrections.

There are many loose notions prevalent in regard to illegitimacy, but very little accurate knowledge; accordingly, the author has attempted to gather within a convenient space authentic statistics on the subject, particularly in connection with the British Isles, but also with some reference to other parts of Europe as well. For the United States the sources of information are meagre.

The first striking fact is the remarkably uniform number of illegitimate births from year to year. During the eleven years 1879-89 the largest number in England was 43,155, the smallest 40,627; in Scotland the extremes were 10,727 and 9,643; in Ireland 3,367 and 3,049. In the same length of time, of 1000 children born, in Ireland from 25 to 28 were illegitimate, 46 to 49 in England, 79 to 85 in Scotland. The same uniformity is seen when we examine the statistics of any individual county for a series of years, some counties having a uniformly large percentage, others an equally low one. To select a few illustrations: of the four northern counties of England, Westmoreland and Cumberland average 70 and 76 illegitimate births per 1000, Durham and Northumberland 41 and 54; again, Norfolk 74, its neighbor, Suffolk, 57. In Scotland the northern counties average 77 per 1000, the northeastern 141, the northwestern 64, the east midland 89, the west midland 65, the southeastern 78, the southwestern 68, and the southern 139. In Ireland, Munster furnishes an average of 17 per 1000, Leinster 22, Connaught 7, and Ulster 40.

Such variations in the different subdivisions of the members of the United Kingdom, and, secondly, the persistence of the same, or nearly the same, average rate in those separate parts, give rise to a number of questions; for counties which showed high rates thirty and fifty years ago show, as a rule, high rates today, and those with a low average then have generally a low average now. What, then, is the influence of poverty? of country and town life? of education? of religion? of legislation and restraints to marriage? of heredity?

It does not appear upon investigation that poverty, city life, and ignorance are so responsible for illegitimate births as one is apt to presuppose. In Ireland the poverty-stricken county Mayo shows 5.6 illegitimate births out of every 1000, the prosperous county Down 51.1. This fact, in varying proportions, is seen over and over again in all countries; not, however, that poverty and chastity always go together, but the presence of the one is not so marked by the absence of the other that any relation of cause and effect between the two can be established. The same is true of town and country life; London, Birmingham, and Liverpool are considerably more virtuous, so far as the proportion of illegitimate births is an index, than are North Wales, Westmoreland, Cumberland, and Shropshire. The prevalence or absence of ignorance, too, is no sure guide, as can be seen from comparing the various countries of Europe, and also from a comparison of smaller districts.

Religion, legislation, and heredity, on the other hand, seem to be the most potent factors in determining the percentage of fatherless children. Religious influences certainly affect conduct, but no peculiar virtue can apparently be asserted for any particular creed. Rigid Calvinism does not prevent the Scottish maiden from going astray; Lutheranism is not a sure protection to the Norwegian and Swede; and though the Roman Catholics of Ireland are comparatively chaste, their sisters of Bavaria do not reach the same standard. But in Bavaria, Austria, and some other countries another consideration is involved,—legal hinderances to marriage. Finally, there is the question of hereditary influences and local sentiment as tending to perpetuate an evil once established in a community. It must, moreover, always be borne in mind that the presence or absence of a high rate of illegitimacy cannot be assigned to any one or two causes exclusively, but that many considerations working together have to be taken into account. Furthermore, concealment is ever possible to a

larger or smaller extent, and even the most careful enumerations cannot be entirely without error. Also, the proportion of illegitimate births is not of itself alone a sure indication of the standard of sexual morality prevailing in a neighborhood or state.

The second study of this volume — on the influence of seasons upon conduct — need be merely referred to. The results may be summed up in a few words: the warm months are the most conducive to attempts at suicide, to attacks of insanity, and to the commission of crimes; the cold months are the least so. Dr. Leffingwell enters into a careful examination of the subject, and brings to his aid data gathered from various countries on the different phases of the topic; he concludes "that either by the gradual increase of solar light and solar heat, or else in some other manner quite mysterious at present, the breaking up of winter and the advent of spring and summer seasons, produces upon all animated nature a peculiar state of excitement or exaltation of the nervous system."

CHARLES F. A. CURRIER.

MORTGAGE INDEBTEDNESS IN EUROPE.

The real-estate mortgage indebtedness and the subdivision of land holdings in eight European nations are the subjects of *Reports from Her Majesty's Representatives Abroad on the Position of Peasant Proprietors*, presented to Parliament in February, 1891. These reports are much more satisfactory, statistically, than the reports from the consuls of the United States, in regard to mortgages in foreign countries, published in November and December, 1889.

Some information in regard to real-estate mortgage indebtedness has been gathered in Austria-Hungary, Prussia, the Netherlands, and Sweden; but Her Majesty's representatives have not presented the statistics of mortgages that they obtained in these countries so clearly nor with such explanation as is required to make their meaning and trustworthiness clear. No attempt seems to have been made anywhere to go back of the mortgage records, and it must be supposed that the face of the records considerably exaggerates the true amount of indebtedness. That this is so in Sweden and in Switzerland is expressly stated in the reports.

The report from the minister to Austria-Hungary contains tables showing in one class the mortgage indebtedness on the real estate of peasant proprietors, on factories, and on house holdings outside of villages in nine provinces, with some classification of indebtedness by objects.

It appears that in 1888, 8.66 per cent of the cases of increase of indebtedness were for the security of purchase money; the amount of debt represented by these cases being 15 per cent of the total amount. These would be remarkably small proportions in the United States, where the percentages for purchase money commonly range between 50 and 75 per cent.

In the vague description of increase of indebtedness "by loans contracted," 42.10 per cent of the number of cases of increase and 52.28 per cent of the amount are included for the same year; and other contracts contributed 7 per cent of the number and 13.29 per cent of the amount.

The percentages for charges on the real estate entered on the records previous to the production of the documents proving their full validity constituted 1.18 per cent of the total number of cases of increase, and 0.80 of 1 per cent of the total amount; while to the issue of warrants for the carrying out of execution 31.10 per cent of the cases of increase of indebtedness are due, and 7.23 per cent of the amount. That nearly one-third of the cases of increase of indebtedness on the real estate of peasant proprietors is due to judicial process appears very remarkable in the United States, where this class of real estate indebtedness is insignificant compared with the total incumbrance.

The partition of real estate inheritances among heirs in these provinces was the cause of 9.96 per cent of the number of cases of increase of indebtedness, and of 11.40 per cent of the amount, this class of indebtedness being virtually the securing of purchase money. But if we add these to the purchase money class, and call the percentage for number of cases representing purchase money 18.62, and the percentage for amount 26.40, still these percentages are very small compared with those found in the United States.

The report from Austria-Hungary lacks needed comparison with peasant population, and with the value of the mortgaged real estate; but it appears that the returns for "small holdings" of peasants, including holdings, factories, and house holdings not situated in towns in these provinces, show that the indebtedness on these holdings has

increased from 1,369,276,041 florins to 1,942,850,083 florins from 1867 to 1888, or 41.89 per cent, the most marked increase being during the four years 1873-76.

During the last 40 years in Denmark the incumbrance on farms has increased from 25 per cent of the value of the landed properties to more than 50 per cent of their value, this increase being due to fluctuations in real-estate values. A century ago the debt was about 40 per cent of the value of the estates, and during the years 1870-84 it was about 43 per cent of the value. These are rough calculations which the report does not substantiate with statistics.

Mortgages were first the subject of satisfactory inquiry in Prussia in 1882, when it was ascertained that in 52 judicial districts the burden of the large estates amounted to 28 times the net proceeds of the land tax derived from them, and that of the middle-sized estates to 18 times the land tax derived from them. This difference is explained by the statement that, with the exception of entailed estates, the large estates change hands on an average every 13 years, whereas the middle-sized estates seldom change hands.

Since 1886 the government has collected annual statistics of the increase and decrease of mortgage debts with the following results: "In the year 1886-87 the mortgage debts of all the landed estates in Prussia increased by 133,160,000 marks; in 1887-88, by 88,030,000 marks; and in 1888-89 by 121,020,000 marks; that is, 342,210,000 marks in three years, a sum equivalent to from 1 to $1\frac{1}{2}$ per cent of the total value of the landed property. Now, as the middle-class estates amount to about the half, the increase of debt during the last three years, if equally distributed, amounts to about 171,000,000 marks; but, as it is ascertained that the indebtedness of the large estates is to that of the middle-sized ones as 28 to 18, the increase of the debt must be reckoned at about 113,000,000 marks. The increase of these debts must be attributed to the bad harvests of the last years, and to divisions of inheritances. In general, the inquiries have shown that the owners of middle-sized estates are not overburdened with debt, and that their condition in this respect is better than that of the owners of large estates."

The indebtedness of peasant proprietors in the Netherlands increased from 959,948 florins in 1883 to 1,888,872 florins in 1887, and this increase is ascribed to agricultural depression.

The total mortgage debt on the landed property of the country

districts of Sweden amounted to £36,507,064 in 1877, and increased steadily from year to year to £50,797,077 in 1886.

Reports in regard to the subdivision of real estate holdings are much more satisfactory than those in regard to mortgages. The division of estates by inheritance, often under compulsion of law, has been carried to a greater extreme in France and Switzerland, and some other parts of Europe, than in the United States. The statistics covering this topic in these reports are substantially the same as have been reported by the consuls of the United States, and published by the State Department.

GEORGE K. HOLMES.

STATISTICS OF DIVORCE IN FRANCE.

In No. 8 (Dec., 1889) of the Publications, Mr. B. F. Keller, in a review of an article by M. Turquan, entitled *Résultats Statistiques de cinq Années de Divorce*, which appeared in *L'Économiste Français* of Oct. 26, 1889, presented some of the results of divorce legislation in France since 1884.

Mr. Keller criticised some of the conclusions of M. Turquan on the ground that the latter had made use of two sets of returns in the compilation of his tables. One of these sets was taken from the records of the officers of the civil state, and the other from the records of the courts. These two sets of records sometimes vary considerably for the same year, owing to various causes of delay (such as appeals, etc.) in the courts. For this reason the slightest reflection will show that the statistics of the officers of the civil state should be greater than the records of the courts. It was on the disagreement of results obtained by using both sets of records that Mr. Keller based his criticism.

A similar criticism has recently appeared in a French journal under the title of *La Statistique des Divorces et les Jugements de Divorce*, by P. de Loyne. (*La Reforme Sociale*, May 1, 1892.) M. de Loyne severely criticises the nonconformity of the two sets of records, and urges that steps be taken to remedy the evil. He states that we should expect the records of the officers of the civil state to show

more divorces than the court records. This, however, is not the case in 1884 (see Mr. Keller's table loc. cit., page 472), when both sets of records were the same. Nor in 1885, when the records in the first case gave 4277 divorces, whereas the court records gave only 4123. For the two years (1884 and 1885) there would be a difference between the two sets of records of 154 divorces. If we subtract from this the number of judgments reversed by the courts (32), we have a remainder of 122 divorces more than were allowed by law during those two years.

G. N. C.

ANTHROPOMETRY.

The results of Anthropometry as derived from the measurements of the Students of Amherst College. Amherst, 1892. Pp. 7, Tables.

This paper was presented to the American Association for the Advancement of Physical Education at their annual meeting in Philadelphia, April, 1892. It begins with a sketch of the historical development of the idea that physical measurements may afford a basis for the determination of the ideal man, and presents a further treatment of this enquiry with which Dr. Hitchcock is so thoroughly identified.

Since 1860 about three thousand students have been measured by the Department of Physical Education at Amherst College. The results have been carefully tabulated in several different ways, and are given in six tables appended to this report. All measurements are expressed in both metric and common units. The 54 items noted are derived as follows: weight (1), heights (6), girths (23), breadths (10), lengths (4), strengths (8), lung capacity (1), and pilosity (1).

The six compilations given are: (1) *Table of the Average Student*, showing the average of each item for 7988 men measured. (2) *Table of the Student 21 years old*, showing the measurements of 326 men between the ages of twenty-one and twenty-two years. (3) *Table of the Student of Mean Proportions*, showing the arithmetical mean of the measurements of 2086 men. (4) *Table of 50 per cent Measurements*, showing the items for 2230 men arranged by Galton's Percentile Method. (5) *Table of Ages*, showing the measurements of 1430 men between the ages of sixteen and twenty-six, arranged in ten groups. (6) *Table of Heights*, in which the measurements of 1322

men are grouped under the differing body heights from the lowest to the highest, with the variation of one centimeter, or about half an inch in each group.

After indicating that each of the features emphasized in the tables is of great importance, he says: "But for educational and developmental study where so much of the need of physical training now lies, for the training, strengthening, and developing of weak and poorly developed bodies, the *standard of stature* seems the safest and surest to work from."

R. W.

A UNIVERSITY COURSE IN STATISTICS.

In the Programme of Courses in Political Economy announced for 1892-93, by the University of Chicago, it is stated that a course in statistics will be given by Mr. Fisher. The scope of the instruction is indicated by the following paragraphs:—

The purpose of this course is to train students in the theory and methods of statistics. Inasmuch as economic principles throw light upon the proper choice and comparison of statistical data, a knowledge of the Course in Political Economy is a prerequisite to entrance into this course. On the other hand, statistical methods are needed for the correction and furthering of our knowledge of economic principles.

Attention will be given to the vast statistical material at hand, and the student will have an introduction into the bibliography of the subject. The growth of the study, establishment of statistical offices and their organization, collection and elaboration of data, detection and elimination of errors, presentation of results in tabular form, training in graphic representation, will form a part of the work.

Practical exercises will be required of each student in connection with the collection and presentation of statistics of mortality, insurance, production, population, wages, prices, trade, crime, etc. The great libraries of the city of Chicago will furnish exceptional advantages for this work.

CONVENTION OF COMMISSIONERS OF BUREAUS OF LABOR STATISTICS.

The Ninth Annual Convention of the National Association of Chiefs and Commissioners of Bureaus of Statistics of Labor was held at the Windsor Hotel, Denver, Colorado, beginning Tuesday, May 24, President Carroll D. Wright, of the United States Department of Labor, in the chair. An address of welcome in behalf of the State of Colorado was delivered by Governor Routt, and Mayor Platt Rogers welcomed the delegates in behalf of the city of Denver. Andrew Chalmers, Esq., also spoke in behalf of the Trades and Labor Assemblies of Denver. The roll of the States was then called, the responses showing sixteen Bureaus represented by twenty delegates, fifteen of whom were Commissioners or Chiefs, and five Secretaries or Chief Clerks.

On Wednesday, the twenty-fifth, the Convention listened to reports of current work from the different State bureaus represented in the Convention. A condensed summary follows:—

MASSACHUSETTS. Horace G. Wadlin, *Chief*. The Bureau is at present engaged in a comprehensive investigation respecting the population residing in rented tenements in the city of Boston. This will cover the number of families residing in hired tenements throughout the city, without restriction as to class; number of persons per room; full information as to rents and sanitary condition (including details as to ventilation, yard room, water-closets, etc.), derived from a house to house canvass of the city conducted by special agents of the Bureau. The investigation will also disclose the occupations and nativities of the population, and other special data. The results of the investigation will be of value in the consideration of the tenement house problem, and will accurately portray the concentration of population in certain quarters of the city, the effect of immigration upon the growth of the city, and will throw much light upon the social condition of the tenement house population of a great city. As the investigation is exhaustive, the best and worst conditions will be shown. The reports will be accompanied by maps.

PENNSYLVANIA. Albert S. Bolles, *Chief*. The current work of the Department covers three topics: 1. Employers' liability for

injuries to their employes. 2. Strikes. 3. Commerce and ship-building on the Delaware from the earliest times to the present. With regard to the first topic the report will present a digest of all judicial decisions on the subject rendered in Pennsylvania from the earliest recorded, about 300 in number, and a résumé of legislation respecting employers' liability in the United States and foreign countries, with a draft of a bill to be presented to the legislature of Pennsylvania. The subject of Strikes will be treated statistically, with full details of the strike among the miners last May, one of the most serious disturbances that has ever taken place in Pennsylvania. The third subject mentioned will embody a historical account of the rise and growth of one of the great industries of the State.

CONNECTICUT. Samuel M. Hotchkiss, *Commissioner*. The forthcoming report will present statistics of manufactures in Connecticut upon the plan followed by the Department for several consecutive years, continued for the purpose of comparison. The report will also contain the results of an exhaustive study of the Fraternal and Mutual Benefit Societies of Connecticut, or doing business there, the object of these societies being to guard their members against the contingencies of accident or death by paying sick or funeral benefits, or life insurance. The investigation of this subject was conducted by mail, supplemented by the work of special agents, using carefully prepared schedules of inquiries. The report will contain full statistical details as to membership, dates of organization, amounts paid for sick benefits, and for insurance, expenses of management, present financial status, etc., and will also present full information as to the different modes of conducting such societies or associations, and as to the general results of their operations for the five years ending with 1891.

MISSOURI. Willard C. Hall, *Commissioner*. The law under which this Department is conducted requires routine annual reports upon certain matters, chief among which is the sanitary condition of factories and workshops. The current report will cover these subjects as usual. Besides this, the Commissioner has carried on an investigation relative to mortgage indebtedness upon farm property in Missouri, to be presented in connection with returns derived from the Eleventh United States Census, and with the census returns covering twelve consecutive years; an investigation relative to the condition of labor organizations in Missouri; and, finally, an inquiry as to the advisa-

bility of establishing free public employment offices, such as exist in Ohio.

INDIANA. William A. Peelle, Jr., *Chief*. This Bureau reports biennially, and is now completing work, reported as in progress at the Convention held last year, relating to wages, hours of labor, co-operative labor, child labor, profit-sharing, and cost of living.

NEW JERSEY. James Bishop, *Chief*. (Report made by Mr. Simmerman, Secretary of the Bureau.) The current report will contain the annual returns as to Condition of Building Associations, required by the statute of New Jersey. The investigations previously made as to the number of years workmen actively continue to follow their trades are to be continued. The Bureau has already reported as to hatters and potters, and will now present data as to printers and the building trades. The results are considered of value in connection with the subject of industrial insurance, inasmuch as they bring out the average duration of employment by workmen in the different industries.

NEW YORK. Charles F. Peck, *Commissioner*. (Report made by Edward J. Kean, Chief Clerk.) The Bureau has completed ten years' work, and is preparing a review and summary of investigations made during that time. It will also present a digest of labor legislation in the State of New York, and will continue its usual statistical abstract of strikes, now presented for several consecutive years.

MICHIGAN. Henry A. Robinson, *Commissioner*. The work now going forward covers the subjects of cost of living, condition of workmen in the building trades in Michigan, and farm indebtedness. The last-named topic will be presented in a manner to allow comparisons as to increase or decrease of mortgage indebtedness, with results determined in a report made by this Bureau in 1887. The current report will also present statistics of wages in Michigan, particularly in Detroit, compiled for a series of years.

CALIFORNIA. George S. Walts, *Commissioner*. The Commissioner gave a detailed account of the difficulties surrounding the collection of statistical data in California, his present work being to overcome some of these difficulties, and to prepare suitable schedules.

COLORADO. Lester Bodine, *Commissioner*. The report will cover the following subjects, all of which are specified in the statute under which the Bureau operates: Mining, silver production, agriculture,

manufacturing, wages, hours of employment, railroad labor, child labor, education of children, labor organizations, sanitary condition of workshops, employers' liability, the Chinese, convict labor, unrestricted immigration, the employment of women and girls, employment agents, the sweating system, strikes, and the unemployed. The subjects of child labor, women wage-workers, and employers' liability will receive special attention.

IOWA. J. R. Sovereign, *Commissioner*. Owing to circumstances explained by the Commissioner, the biennial report of this Bureau, now in progress, is not fully outlined. It will, however, contain a part devoted to the movement of the population from rural towards urban districts in Iowa, with comparisons as to the similar movement in other States. The subject of child and female labor will also be considered, and the question of markets for Iowa products.

KANSAS. Frank H. Betton, *Commissioner*. The report will cover the subject of hours of labor of railroad employes in Kansas. The data have been carefully collected from original sources by the Commissioner, and will be thoroughly analyzed and presented for the entire State. A summary compiled from reports issued by the Bureau for six consecutive years, beginning with 1885, will present average wages per year; average amount of time unemployed per year; and data as to the trend of prices for necessities of household consumption (groceries, clothing, and also rents) during the same years.

MAINE. S. W. Matthews, *Commissioner*. The current work is devoted to collection of data upon wages and cost of living, particularly of women and child workers in factory employments; also as to the membership of trade organizations in the State.

NEBRASKA. Philip Andres, *Commissioner*. The report will cover the following topics: Mortgage indebtedness; irrigation; profits in agriculture; shipments of surplus farm products of the State; the eight-hour law; and women and child labor. This Commissioner is also factory inspector.

MINNESOTA. L. G. Powers, *Commissioner*. The Commissioner is also factory inspector. The current work relates to inspection, and to the collection of data on the need of more perfect factory legislation. An investigation is also in progress as to the commercial and economic benefits derived from trades unions. The investigation begun sometime ago as to the effect of the improvements in milling upon wheat prices will be continued.

During the sessions of the Convention a general discussion took place as to methods of work and the best means of advancing the interests of statistical investigation. Thursday the annual election of officers occurred, resulting as follows, President Wright declining re-election: President, Charles F. Peck, New York; Vice-Presidents, Lester Bodine of Colorado, and S. W. Matthews of Maine; Secretary, Frank W. Betton of Kansas; Executive Committee, Messrs. Wadlin of Massachusetts, Hotchkiss of Connecticut, Peelle of Indiana, and the President ex-officio. The next Annual Convention will be held at Albany, New York.

H. G. W.

STATISTICS OF PRISONERS, 1890.

Statistics of Prisoners, 1890. Collected by the Wardens' Association of the United States and Canada; with an introduction by Roland P. Falkner, Ph.D., Associate Professor of Statistics, University of Penn. Published by the Association, 1892. 800. Pp. 56.

The Wardens' Association of the United States and Canada, as explained by its secretary in the preface to this pamphlet, undertook the collection of these statistics at the suggestion of Dr. Falkner. The tabulation was carried on under the supervision of the secretary, according to plans matured in conference with Dr. Falkner, and the latter has written the entire text of the report. The scope of the inquiry was limited. Returns were received from thirty-eight institutions in the United States, giving record of 9859 prisoners admitted during the year. This is thought to be considerably more than half the entire number of prisoners received at all the prisons of the country during 1890. The information obtained is therefore not only valuable by virtue of the care with which the facts were gathered, but also because of its amount.

In tabulating the facts gathered an effort was made to exhaust the useful permutations through which they could be put. Then, in the twenty-five pages of text, the writer confines himself rigidly to an exposition of what the nineteen tables show. In other words, the attempt was made to formulate all the conclusions which could be reached by purely statistical methods after an investigation of this kind and no others. Many inviting opportunities to base sweeping

conclusions on insufficient data are pointed out only for the purpose of calling attention to the insufficiency of the data.

Particular attention may be called to the portions relating to race, nativity, and parentage, both as an illustration of the care with which the work is done, as well as of the importance of some of the conclusions.

A. G. WARNER.

A CORRECTION.

In his review* of the Report of the Special Committee on Out-Door Alms of the Town of Hartford, 1891, Dr. Warner calls attention to the fact that the per capita cost of poor relief for European countries does not follow from the figures presented by the committee, but is caused by an arithmetical error. Dr. Warner informs us that in a subsequent issue of the Report this has been corrected. The error was two-fold, the figures for cost of poor relief in England and Wales should have been \$42,204,105 instead of \$101,012,325. Making this correction and dividing by the total population of Great Britain, the figure \$1.43 per capita is obtained instead of \$1.07. This corrects the statistical table of the committee, and eliminates its manifest inaccuracies. It does not change the contention of the committee that Hartford spends more money than the British Isles, as the per capita expenditure in Hartford is \$1.96. This correction is made in justice to the Committee. It does not weaken any material portion of Dr. Warner's criticism.

NET PROFITS OF MANUFACTURING INDUSTRIES IN THE STATE OF MASSACHUSETTS.

I have read with much interest the 21st report of the Bureau of Statistics of Labor of Massachusetts, and also the review of the same in the article by Frederic B. Hawley, in the March *Publications of the American Statistical Association*. It has seemed to me that the net profits of manufacturing for a given time, at least to the shareholders in manufacturing companies, could be arrived at with mathematical accuracy. If, on the 1st of January of any given year, a man bought

* Page 437 of Volume II of these *Publications*.

a given manufacturing stock at the market price, and held it for ten years; received all the dividends, stock or otherwise; paid all the assessments, and at the end of the ten years sold it at the market price, the calculation of the percentage made on the capital that he invested would not be a difficult one. By adding together all the corporations whose statistics are attainable for an equal length of time, it would seem to me to give a fair average of the profits made in manufacturing for that length of time. Improvements or depreciations in plant are elements which enter into the selling price of the various stocks, and the selling price of stocks is a better estimate of their value than any mere appraisal of the property upon which the stocks are based.

Mr. Jos. G. Martin, of Boston, has issued annually a statement of stock fluctuations in Boston bank, insurance, railroad, manufacturing, and other stocks and bonds, together with the dividends paid by each. In his manufacturing lists he has also included the Fall River Manufacturing Companies.

From those lists I have taken every Massachusetts company mentioned in 1882 for which figures are given for ten years. The list follows, and comprises 65 companies in various kinds of business, including the cotton and woollen manufacture, bleacheries, belting, and machinery. Of these 65 companies 41 mentioned immediately below have maintained the same capital during the ten years from 1882 to 1892:—

Appleton.	Lancaster.	Slade.
Boston.	Lowell.	Troy Cotton Mill.
Boston Duck.	Lyman.	Thorndike.
Dwight.	Merrimack.	Crescent.
Hamilton Cotton.	Naumkeag.	Granite Mills.
Lawrence.	Pacific.	Laurel Lake.
Lowell Machine.	Tremont & Suffolk.	Merchants.
Massachusetts.	Chace Mills.	Narragansett.
Middlesex.	Fall River M'fry.	Richard Borden.
Otis.	King Phillp.	Shove.
Boott.	Mechanics.	Tecumseh.
Boston Belting.	Metacomet.	Union Cotton.
Chicopee.	Pocasset.	Weetamoe Mills.
Flint Mill.	Robeson.	

Five, named below, have stopped during the ten years : —

Annawa Mills.	Montaup.	Sandwich Glass Co.
Fall River Merino.	Quequechan.	

Seven, named below, have had their capital impaired and replaced during the ten years : —

Atlantic Mills.	Lowell Bleachery.	Davol Mills.
Everett Mills.	Washington Mills.	Sagamore Mills.
	Hamilton Woollen Mills.	

Twelve, named below, have increased their capital during the ten years : —

Arlington Mills.	American Linen Co.	Barnard M'fg Co.
Border City M'fg Co.	Barnaby M'fg Co.	Conanicut Mills.
Crystal Spring Bleach	Fall River Bleachery.	Globe Yarn Mills.
& Dye Co.	Stafford Mills.	Wampanoag Mills.
Osborn Mills.		

In making my calculations I have divided the companies into two groups : First, the 41 that have gone through the ten years with unchanged capitals ; and, second, the 24 that have been unfortunate or put in additional capital during the same time.

I have also made a calculation, by combining these two sets of figures, to show what amount of interest on investment a man would have made who had bought the stock of all these companies on the 1st of January, 1882, and sold them on the 1st of January, 1892, meantime paying in all the money that was paid in, and receiving all the dividends that were declared.

The results for the 41 companies with unchanged capital appear in table on next page.

Summarizing, I find the total dividends \$24,420,913 for ten years (which would be an average dividend of \$2,442,091.13 per year) to be 6.58 per cent per annum of the par value of the stocks of the above companies. I also find the above annual dividend to be 4.88 per cent of the average selling price for 1882 and 1892, which is \$49,993,616. I also find that taking the price at which the stocks could be bought January 1, 1882, which was \$55,496,350, and the price at which the stocks could be sold January 1, 1892, which was \$44,490,883, that there is a loss in the selling value during the ten years of \$11,005,467. Deducting this from the total amount of dividends, \$24,420,913, we have left \$13,415,446 as the net income for the ten years from 1882

107] *Net Profits of Manufacturing Industries in Mass. 195*
**LIST OF COMPANIES WHOSE CAPITAL HAS NOT CHANGED DURING THE
TEN YEARS FROM 1882 TO 1892.**

	Par Value.	Market Value Jan. 1, 1882.	Market Value Jan. 1, 1892.	Ten Years Dividends.
Appleton.....	\$600,000	\$717,000	\$345,000	\$138,000
Boott.....	1,200,000	2,580,000	1,620,000	924,000
Boston.....	800,000	1,060,000	848,000	520,000
Boston Belting.....	700,000	1,225,000	1,422,750	749,000
Boston Duck.....	350,000	525,000	562,500	325,500
Chicopee.....	1,000,000	1,900,000	900,000	600,000
Dwight.....	1,200,000	1,920,000	1,800,000	1,068,000
Flint Mill.....	580,000	406,000	609,000	342,200
Hamilton Cotton.....	1,800,000	2,196,000	1,800,000	648,000
Lancaster.....	1,200,000	2,700,000	1,806,000	1,020,000
Lawrence.....	1,500,000	2,700,000	2,250,000	1,365,000
Lowell.....	2,000,000	2,101,775	1,833,333	803,023
Lowell Machine.....	900,000	2,277,000	1,305,000	810,000
Lynan.....	1,470,000	1,719,900	970,200	558,600
Massachusetts.....	1,800,000	2,520,000	1,800,000	1,026,000
Merrimack.....	2,500,000	4,600,000	2,625,000	1,600,000
Middlesex.....	750,000	1,875,000	975,000	765,000
Naumkeag.....	1,500,000	1,890,000	1,590,000	802,500
Otis.....	800,000	1,040,000	1,480,000	800,000
Pacific.....	2,500,000	4,750,000	4,187,500	2,125,000
Tremont & Suffolk.....	1,200,000	2,103,000	1,464,000	738,000
Thorndike.....	450,000	495,000	540,000	342,000
Chace Mills.....	500,000	535,000	500,000	285,000
Crescent Mills.....	500,000	400,000	175,000	167,500
Fall River M'ry.....	180,000	315,000	216,000	59,400
Granite Mills.....	400,000	1,310,800	960,000	612,000
King Philip.....	1,000,000	1,200,000	1,150,000	490,000
Laurel Lake.....	400,000	376,000	448,000	216,000
Mechanics.....	750,000	862,500	637,500	397,500
Merchants.....	800,000	1,000,000	960,000	480,000
Metacomet.....	288,000	288,000	201,600	44,640
Narragansett.....	400,000	400,000	388,000	230,000
Pocasset.....	800,000	480,000	1,088,000	264,000
Richard Borden.....	800,000	680,000	780,000	368,000
Robeson.....	260,000	234,000	221,000	105,300
Shove.....	550,000	677,500	632,500	294,250
Slade.....	550,000	496,000	330,000	178,750
Tecumseh.....	500,000	660,000	512,500	322,500
Troy Cotton Mill.....	300,000	540,000	585,000	300,000
Union Cotton.....	750,000	1,374,375	1,575,000	1,357,500
Westamoe.....	550,000	467,500	247,500	178,750
	\$37,078,000	\$55,496,350	\$44,490,883	\$24,420,913

to 1892, which would figure 2.68 per cent as the net income per year. In making these calculations of the selling values I have taken, on the stocks outside of Fall River, the figures for each 1st of January, as shown on Martin's report, while on the Fall River stocks the report for several years shows simply the highest and lowest price of each stock for the year. In valuing these Fall River stocks I have taken for 1882 the lowest prices for the year, and for the selling value in 1892 I have taken the market price January 1st, which allows the leeway in favor of a larger per cent on the total results.

We will next consider the figures of the 24 companies above named whose capital was changed, or whose enterprises were stopped during the ten years:—

Their total par value Jan. 1, 1882, was . . .	\$11,800,000
Their total par value Jan. 1, 1892, was . . .	14,875,000
Or an average par value for the time of . .	13,337,500
The amount of dividends paid on these stocks	
for the ten years was	6,719,250
The amount paid in was	6,135,000
Leaving an excess of dividends over capital	
paid in of	584,250

for the ten years, or \$58,425 per annum, or less than half of 1 per cent on the capital stock, and still less than that on the average selling price.

Ascertaining the loss or difference between the selling price of these companies Jan. 1, 1882, \$14,828,375, and the selling price Jan. 1, 1892, \$14,111,000, we find it to be \$717,375. Deduct from that the margin of dividends above payments, \$584,250, and it will appear that these 24 companies lost \$133,125, besides interest on their capital, for ten years.

Now, combining the two sets of figures, we find:—

That the 65 companies had an average capital	
for the ten years of	\$50,415,500
That the selling price of stocks Jan. 1, 1882, was	70,324,725
That the selling price Jan. 1, 1892, was . . .	58,601,883
That the total dividends paid amounted to . .	31,140,163
That the amount of cash paid in was	6,135,000

Deducting the cash paid in from the dividends leaves \$25,005,163 net cash received by stockholders, or an average of \$2,500,516 per annum. This is equal to 4.86 per cent on the capital stock. The

average selling price ascertained as before was \$64,463,304. On this sum the average dividend was 3.87 per cent. The loss in value of all the stocks for the ten years was \$11,722,842. Deducting this from the dividend leaves \$13,282,321, or 2.06 per cent on the average value of the capital invested.

The change in value of the manufacturing stocks may, of course, be said to depend in part upon the years selected. If the selection of one year was during a particularly prosperous time, and the selection of the other year was during a panic, differences would appear which would not be normal. So far as general business is concerned, however, the year 1892 is reckoned as good as the year 1882, and the comparison of those two years would, in that view, seem to be a fair one. Such of these stocks as appear in Martin's Report for 1881 average even higher than they did in 1882, and in 1880 somewhat lower, but not nearly as low as in later years. On the other hand, there was a continuous and large decrease of value in these stocks, amounting to substantially 20 per cent, between 1882 and 1886, and a moderate increase amounting to about 5 per cent on the remaining value since that time.

It is evident from these figures of selling price at different periods that these corporations, as a whole, have been paying out in dividends more money than they have earned during the past ten years, proper depreciation being taken into account.

As the average dividend paid, saying nothing about loss of value, was 3.87 per cent, it looks as though either these great corporations have been particularly unfortunate during the last ten years, or that the figures of the Commissioner are unduly high, and the deductions of Mr. Hawley still more so.

If it be claimed that private concerns make more than corporations, it is, in the first place, a statement difficult of proof; and, in the second place, it would seem to be contradicted by the well-known fact that corporate enterprises are rapidly taking the places of private ones in all large lines of business. I do not care to introduce personal experience in this connection; but that experience in several lines of business—in managing concerns that have always paid their debts—agrees with the above statement,—that manufacturing companies in competitive lines of business cannot expect to pay over 6 per cent on capital, and the usual salaries for supervision. Those having some specialty may do better; those laboring at a disadvantage, either in

location or management or anything else, are pretty sure to do worse. Two matters of argument of Mr. Hawley I will briefly refer to, as they do not seem to me to be sound. The first is, substantially, that since manufacturers pay a given rate for interest, they must make more than that rate. This is not necessarily so; in fact, the contrary is very often true. I am a director in a concern that has declared 5 per cent annual dividends irregularly, and has paid 6 per cent per annum or more for money most of the time. The less prosperous the business the more a party will have to pay for interest, as a rule. Another argument of his in regard to a small business, in connection with a person having a capital of \$10,700, seems to me wrongly based. He supposes that that amount of investment and the owner's services will produce \$2000 per annum, which I presume would be true, on an average. Instead, however, of dividing that \$2000, as he does, into \$600 wages, \$535 interest, and the balance profit, I should divide it into \$535 interest and profit, and the balance wages. Any man who is capable of carrying on business profitably with an investment of \$10,000 is also probably capable of commanding a salary \$1500 a year if he works for another.

I have no doubt that the net income of all manufacturing concerns is enormously over-estimated by the general public, and that many agrarian and socialistic ideas have as a basis the supposed enormous profits which are made in business. I know of no way so good of arriving at this profit as the course pursued in this paper if continued for a sufficiently long term of years. The general and incidental expenses of business which it is difficult to itemize in advance, but which must be paid just the same, either from principal or profit, form an item of much greater magnitude than most statisticians suppose.

Depreciation is another item that is seldom figured high enough, especially in these days of invention, when the production of a new machine may make the equipment of a factory practically valueless. In this paper I am not attempting to compute the average difference between the wages of supervision and the wages of an operative or mechanic, but the income of any individual from an investment in manufacturing or mechanical enterprises, entirely independent of payment for services.

W. F. DRAPER.

HOPEDALE, MASS.

INTERNATIONAL STATISTICAL COMPARISONS.

The following pages are taken from a long paper prepared by Mr. Robert Giffen, C.B., LL.D., and read at the last meeting of the Australasian Association for the Advancement of Science.

I proceed next to statistics from which inferences are commonly drawn as to the qualities of a population,—I mean statistics on such subjects as education, crime, sexual morality, drunkenness, insolvency, and thrift. On all these points different countries have statistics, which may have a meaning when they are properly used, but which it is most difficult to use properly.

To begin with education. Which is the most fortunate population of the world as regards the general education of the people? One often hears of the United States in this connection,—of the numbers of children of school age and the numbers attending school as compared with less fortunate populations. But let me take the following passage from a memorandum by Mr. Fitch, one of Her Majesty's chief inspectors of training colleges, on the working of the Free School system in the United States, France, and Belgium :—

“In England and Wales the calculations of average attendance are made on the assumption that every school is open at least 400 times, or 200 days in the year. It is on this basis that the annual returns in the official report of the Education Department state the average attendance of scholars in infant schools and departments to be 68 per cent, and that in schools for older children to be 82.2 per cent. But in the United States there is no uniform or generally accepted rule respecting the length of the school year. In the principal cities, especially in the East and West, the schools are open 10 months out of 12, and in these the statistics of attendance may be fairly compared with our own. But on taking the country through the average number of days in which the public schools are open is 129 in the year, and this fact implies that in the country places, especially in the South Atlantic and South Central States, the number of school days falls much below that average. In Alabama and in Georgia the schools are open only three months in the year, the teachers are paid by the month, and hold no permanent appointment. In Louisiana and Missouri the small sum appropriated to education by the State barely

suffices to keep the schools at work more than four months in the year. In Nebraska the returns for 5407 schools show 3904 to be kept open for six months and upwards, 529 for more than four but less than six months, and 974 for less than four months.

* * * * *

It is manifest, therefore, that the figures representing the regularity of attendance require material correction and reduction before they can be properly compared with the statistics of European countries in which schools are, as a rule, kept open during nearly the whole of every year."

The second subject I have named in this connection is crime, and in thinking of it I confess I have had in my mind certain comparisons which have been made in England by visitors returned from Australia to the disadvantage of Australia. There is twice the crime in Australian colonies per head of population, we have been told, that there is in England. A distinction has to be made between mere police and administrative offences, which vary largely according to the things which Legislatures in their wisdom subject to fine or not, and the more serious offences, such as robbery and murder, which are what we think of when we talk of crime. But in hardly any two countries that I know of is the distinction drawn on exactly the same lines. Further, even if the distinctions were much the same, another difference is made by the police. You may have fewer trials and convictions in one country than in another simply because the police for various reasons is less efficient, not because there is less crime.

But admitting that exact comparisons can be made, that statistics of crime in two countries are reduced to common denominators, I should like to point out that the logic of using them as indicative in any way of the general superiority of one population over another may be at fault. So far as can be judged, the so-called crime statistics of a country are not necessarily significant very much of the general quality of a population, but they may be significant only of the existence of a criminal element, which is like a disease from which a community suffers, but a disease of a superficial, and not of a vital, character. One population may thus have more crime in it than another, even much more crime, but substantially the two peoples may be almost alike, the extent of the criminality in both being quite immaterial. Say, for instance, that the criminal population by which almost all the crime is done in one country is 1 in 500, or 1-5th of 1 per cent, and

in another population it is 1 in 250, or 2-5ths of 1 per cent, is not the criminal element in either so small as to tell you nothing of the general constitution of the people? Not only, therefore, must criminal statistics be used with care as far as the mere data are concerned, but the difficulty of using them as indicative of the general qualities of a population is overwhelming. They can only be used, if used at all, in conjunction with much other information and statistics.

The statistics bearing on sexual morality are equally difficult to handle. The test here that is most commonly used is that of illegitimacy; but the truth is that illegitimacy by itself tells little, for the simple reason that in a town community there may be prostitution without illegitimate births, whereas in a rural community there may be even less profligacy than in the town, but with a larger number of illegitimate births, in consequence of there being no prostitution. In one country also the births may be registered as legitimate, through the children being born in wedlock; but this may go along with a general laxity of morals of a remarkable kind. Sexual immorality is also like crime itself, even when it can be measured on the same basis in two different communities, more or less a thing apart, and it may or may not be significant of the general *morale* of the population. I suppose it is true, for instance, that the rural population of Ireland stands better, as far as statistics of illegitimacy are concerned, than that of Scotland; but it would be a rash inference that in general *morale* the rural population of Ireland is superior to the Scotch. For certain purposes the statistics are good enough, but they must not be pushed to conclusions they do not bear.

Statistics as to drunkenness also require a good deal of careful handling. In fact, I see no way myself of establishing statistically that one population is more or less drunken than another. Apart from the difficulty already referred to, arising from the different distribution of two populations according to age, so that one population has proportionately more adults than another, and consequently has a larger proportion of convictions for drunkenness and a larger proportionate consumption of alcoholic liquors.—the two tests usually applied in such comparisons,—it has to be considered that the tests themselves are not very good. The convictions for drunkenness, it is plain, like convictions for crime generally, may be very largely a matter of definition and of police administration. Before comparisons can be made the state of legislation and of police administration in

the countries compared must be considered. As regards the consumption of alcoholic liquors again, I have never seen any statistics satisfactorily connecting a relatively large consumption of alcoholic liquors with drunkenness. On the contrary, the consumption in every community is probably at all times much more largely the consumption of sober people than that of people who drink to excess, and you may have much drunkenness among a people who, like the Americans, are generally total abstainers, and little among a people like the populations of the southern states of Europe, who are generally moderate drinkers. Thus the question of drunkenness, or the reverse, in a population is not to be easily treated by statistics.

The statistics of bankruptcy or insolvency again are often quoted as a test of the comparative excellence of commercial communities. Here again I have had in my mind some recent comparisons at home between certain of the Australian colonies and England as regards insolvency. These colonies, we have been told, have twice as many failures per head of population as England, or some such proportion. But the traps in dealing with bankruptcy statistics are innumerable. Even in England it is not easy to compare one period with another, owing to difference of legislation making the conditions and record of official insolvency different at one time from what they are at another. The law at one time makes whitewashing so easy that debtors readily avail themselves of the courts to make themselves officially insolvent, and so you have a large number of bankruptcies in the official statistics. At another time the law is so stringent that debtors evade the courts, while creditors do not make them bankrupt because it is not worth while to do so, and so the official bankruptcies diminish. At one time also non-traders may be made bankrupt, at another time they may not be; and so the record varies. Unless, therefore, the whole basis of the bankruptcy law in each case is studied, no comparison is possible either between period and period in the same country or between different countries. Further difficulties would arise in any comparison owing to the length of the commercial cycle, which renders it most dangerous to take the figures of one year only, or even of two or three years for comparison. We can imagine, then, what wild work is made by amateurs when they compare the insolvency of Australia and England. Apart from these differences there are others which are due to fundamental differences of economic condition. I believe, for instance, that in England a larger proportion of the busi-

ness done is carried on by joint stock companies than is the case in Australia. This may or may not be the case. But, supposing it to be the case, how can the failures of England be compared at all with those of Australia without taking account of the liquidations of joint stock companies, and to how many units of individual failures is that of a joint stock company to be considered equal? I would not go so far as to say that no useful comparison could be drawn from existing data by those who go carefully into the subject and study all the conditions. What I am contending for is that it is utterly impossible for writers in a hurry to make anything of the first figures that come to hand, and assume that the official record of failures in one country at one time means the same thing as the official record of failures in a totally different country at the same or another time.

Here, too, I would also demur to the test of bankruptcy itself as indicative of the general commercial character of a people, even if figures for comparison could be correctly ascertained. More bankruptcy in the one case than in the other may simply mean greater enterprise making more opportunity for failure, and not an excess of dishonesty in the one compared with another. It may also mean that the industries carried on in the one country, and which are suitable to be carried on in it, are essentially more fluctuating at a given period than the different industries of another country. Farming is often the most fluctuating of all industries. A country dependent on farming may suffer more from bankruptcy at a given date than a country less dependent. In turn, a manufacturing or commercial country may suffer more from catastrophies, like war or invasion, than an agricultural country would suffer. Perhaps even these difficulties could be overcome or evaded, and bankruptcy statistics be handled so as to indicate differences of character between two peoples; but the labor of the comparison would be very considerable indeed if anything is to be made of it at all.

I come finally to the last branch of statistics referred to as being often used to compare the character of two people, viz., the statistics of thrift or the diffusion of property among the masses. Here the temptation is to take some one form of saving, such as savings banks, or the holding of land, or investment in government stocks, and roughly judge one people by their habits as to this one form of saving. So far as I have observed, the usual comparisons in detail, even as to the one branch of saving selected for comparison, are most erroneous.

Thus, I have seen the number of separate inscriptions of French *rentes* in the books of the French Ministry of Finance treated as the number of separate holders. The truth is that the question of the number of inscriptions of *rentes*, the inscriptions being anonymous, is purely a formal matter, depending upon the sub-divisions which are most convenient for dealing. One individual may, and as a rule does, hold many inscriptions. When the French issued new loans in 1871 and 1872 to pay the war indemnity to Germany, and in subsequent years to re-equip their army and extend their railways, the number of inscriptions in the books of the Ministry of Finance enormously increased, but it did not follow that the number of separate holders of French *rentes* increased in the same degree, or even increased at all. The same with the holding of land. A broad distinction has to be drawn between the number of separate occupiers and the number of separate occupations, the latter (as in Ireland) being often far more numerous than the former. But, admitting that the figures as to one branch only can be got hold of, it is plain that, unless saving habits in all directions can be compared, no useful comparison can be made at all. What is done by friendly societies, building societies, insurance companies and the like, must all be taken into account, as well as the savings banks, which are most often quoted, or the holdings of the government debt, or the holdings of land, which are the favorite investments of the masses of some countries. But I do not know of any comparison of the kind in which these conditions are complied with. French peasants and working classes are often assumed to be much more saving than the corresponding classes of England, but the statistical proof seems to be wanting, and I am not sure that if the accumulations of English unions, friendly societies, and co-operative societies were properly taken account of, as well as savings banks, holdings of government debt, and investments in land, the English working classes would come so very badly out of the comparison. At any rate, the comparison is more difficult than is often thought.

* * * * *

I pass on next to a class of statistics which are still more frequently used for international comparison, viz., the statistics of production, industry and trade.

The leading statistics thus used may be classed under the heads of agricultural production, manufacturing production, imports and exports, including shipping, wages, and, finally, accumulated wealth.

The division is not a logical one, but it appears convenient for the present purpose, which is to explain the principal dangers into which the unwary in dealing with the vast branches of statistics included in this department are apt to fall.

As regards agricultural production, then, the initial difficulty of all the statistics is that which we have already had in dealing with population itself,—the different value of the units which go by the same name. The wheat, oats, and barley of one country, though called by the same names, are not the same as the wheat, oats, and barley of another country. There are the very greatest differences in quality, as any price list of London or other market, where grain from every part of the world is sold, would show. Yet nothing is so common as comparisons of the world's production of wheat, for instance, in which this difference of quality is ignored, and fine reasonings are indulged in where this difference of quality might seriously affect the result. What is true of grain is as true, if not more true, of live stock. There are sheep and sheep, cattle and cattle, horses and horses; in truth, the agricultural live stock of any two countries, instead of being susceptible of ready comparison, can hardly be compared directly at all. The point is notoriously of great importance in historical investigations. In comparing England of the present day with the England of previous centuries the difference of the average weight and qualities of the live stock called by the same names has always to be considered. In nothing in recent years, as I understand, have some continental countries, such as France, made more remarkable improvement than in the quality of their live stock, so that with no increase in numbers, or little increase, there has been an enormous advance in real production. But the point is of equal importance in international comparisons. If Australia is to reckon with competitors in wool production, like the Argentine Republic, the average clip per sheep in the respective countries is obviously a necessary coefficient in the calculation, and it becomes of great importance to study in what countries the average is increasing or diminishing, and so on. Officials at the head of the agricultural department in France have been greatly impressed by considerations like these, and have endeavored to substitute a count of cattle by weight for the mere count of heads, but even a correction like this would by no means be sufficient, as there might still be serious differences of quality. The comparisons, then, of agricultural production which one often sees, in which unlike units are taken as

equal without more ado, and reasoned upon as if there were no qualifications, are most misleading. Rectification to any exact degree might not in many comparisons be possible, but the consideration of the point would usually make it possible to turn the figures to support some useful conclusion.

In connection with these comparisons it should also be noticed that many of the deductions per head and per acre, into which it is usual to convert the figures of agricultural production, are calculated to mislead, even when the units themselves are comparable, because the comparisons are with the total acreage and total population of a country, and not with the special acreage and agricultural population. What could be more useless, for instance, than to compare two countries like England and the United States as regards their production of wheat or any other agricultural product per head of the whole population, the one population living on its own wheat and other products, and the other not. All such comparisons to be of any value should be made from the purely agricultural point of view,—to illustrate differences in the style of agriculture carried on, or in the fertility of any two countries. But they are often made with lingering notions that all states can, to some extent, be dealt with as agricultural units, which is far from being the case.

Coming to statistics of manufacturing production, again, and this to some extent applies to agricultural and mining production, what we find is that, save as to some particular industry in detail, and for the purposes of discussions of that industry by itself, there is really no common denominator between countries, except in so far as the production of their respective industries can be represented in money. The coal and iron of one country are not the same as the coal and iron of another; the wool is not the same; the cotton, woollen, and linen manufactures of the one cannot be expressed in the same units of quantity as the similar manufactures of the other; the same with manufactures of metals, leather, and wood, and with machines of all kinds. Even if there is a general likeness in industrial characteristics of any two countries such as England and France, yet the different distribution of the leading industries makes any real comparison between the two, as a rule, impossible, except so far as it can be done in money. To make the comparison in money again presents new difficulties. The value of different kinds of production cannot well be reckoned up.

* * * * *

Coming next to imports and exports, the point I would urge first is the initial difficulty of a bare comparison of the figures themselves. Imports and exports, instead of giving us easy statistics for many of the purposes for which they are used, are rarely very difficult. I refer especially to the values. Imports are stated in one country at the value of the goods as at the place of shipment; in another as at the place of arrival. In one country the basis of the statement is a declaration of the value by the importer, checked by the customs authorities; in another there is an efficient commission of values, which takes note of market prices, and fixes official prices for everything at more or less frequent intervals. The same with the exports. The denominators are hardly ever the same in any two countries. The result is that there are continual misstatements by amateurs on such questions as a comparison of two countries in respect of the progress of their foreign trade, or in respect of what is called the balance of trade. The falling off of the foreign trade of one country is contrasted with the growth of the foreign trade of another country at the same time, the truth being that in the one case, owing to the system of valuing by merchants' declarations, the volume of the foreign trade expressed in money responds instantly to variations in the market price, while, in the other, owing to the system of official prices fixed at intervals, the volume of trade does not respond at once to variations in market price. In one country, again, what is called an adverse balance of trade appears to be larger in proportion than it is in another country, largely because the imports are valued as at the place of arrival, including freight and other charges to that place; while in the country with which comparison is made the value is taken at the place of shipment, and does not include such additions. In the latter case, therefore, the exports form a total more nearly approximating that of the imports than in the former. All this confusion is due simply to the fact that the units of the imports and exports are not, in fact, the same. The record is not made in the same way.

* * * * *

Generally, however, I should like to add that the selection of foreign trade, as specially a test of the welfare of nations, does not seem to be in any way justified. Whether the foreign trade of a given country is large or small in proportion to its whole production is an affair to a large extent of size or of historical evolution, and nothing can be

made of comparisons unless attention is given to the point I have already suggested,—that of size and general similarity of conditions. But it is quite conceivable that nations might approximate to each other in many respects, and the one have a large foreign trade and the other not, yet both be in much the same condition of individual prosperity. Accident might determine that the one should be more self-contained than the other, so that its exchanges with other countries should bear a less proportion to its total industry. France and England are very good illustrations of essential differences of this sort, England having much more manufacturing, shipping, and foreign trade than France, but France being certainly a highly prosperous nation, with home industries of different kinds which England either has not at all or not to the same degree, and the products of which are only or largely obtained in England by exporting something else. All these general comparisons between nations in which the foreign trade is spoken of or assumed to be representative of the total trade are therefore very much to be deprecated. Import and export statistics, apart from the special danger of using them, which I have described, cannot be properly used for such comparisons.

I come next to international statistical comparisons in respect to wages, which present some curious difficulties of which most of those who make such comparisons seem totally unaware. In the primary use of records of wages, viz., their use by the laborer or workman, who has no employment, or small wages in one place, and finds he can better himself by going to another, these difficulties do not arise. If the facts recorded are true, the laborer or workman has something on which to act, and he can attend to all the points and qualifications necessary. But when the same records are used, or an attempt is made to use them, for more general purposes, difficulties begin. Length of working day, continuity of employment, and other points must all be recorded when a general statistical account of the wages-earning classes of a people has to be built up. So little have such matters been studied, however, that I doubt the existence of any comparison of wages in different countries which is even formally complete. No country has, as yet, a tolerably complete account of its own wages in which attention is given to all these points; much less is there any possibility of international comparisons.

As the primary records are, however, sometimes used for such comparisons, and we get such statements based on them as that wages are

50 or 100 per cent higher in the United States, say, than in England, special attention may be drawn to the failure of the comparison in point of logic. In the absence of any account of length of the working day and continuity of employment, no proper comparison can be made. This applies specially to a comparison between wages in out-of-door trades in a country like the United States, with a severe climate, and wages in the same trade in England. Wages in the former country may well be higher per nominal day or week of actual work, and yet the difference not be so great when the earnings and hours of labor of the whole year in England are reckoned.

What I would most desire to direct attention to, however, is the statistical importance of a somewhat different point. This is the distribution of the population according to remuneration. It is quite conceivable that in one of two countries the earnings, and still more the nominal wages, may be higher than in the other in every single employment which can be enumerated and compared, and yet the average earnings of the average wages-earning man may be higher in the latter country than the former, the reason being the different distribution of the people according to earnings. This can be shown very clearly in a theoretical comparison. Take first a community of 1000 wages-earners, with the people distributed according to earnings, in the following classes — A, B, C, D, and E — as follows:—

FIRST COMMUNITY.

Class.	Per Annum.	Nos.	Total.
A. Earnings.....	£50	500	£25,000
B. "	60	200	12,000
C. "	70	100	7,000
D. "	80	100	8,000
E. "	90	100	9,000
		Total.....	1,000
			£61,000

Average per head, £61.

And compare this with another community of equal numbers, in which there are also five grades, each remunerated at a lower rate than the corresponding grade in the first community, but in which the average of the whole is higher because of the different distribution of the people among the grades:—

SECOND COMMUNITY.

Class.	Per Annum.	Nos.	Total.
A. Earnings	£40	100	£4,000
B. "	50	100	5,000
C. "	60	100	6,000
D. "	70	200	14,000
E. "	80	500	40,000
		Total.....	1,000
			69,000

Average per head, £69.

In a comparison of rates of wages merely according to the nature of the employment, the wages in the first community would obviously appear higher than in the second, and this would be strictly true in a sense; but the inference would be untrue that the average earnings of the wages-earning classes in the first community, striking a true average, would be higher.

The principle of this theoretical comparison I believe helps to explain the actual facts as between an agricultural new country like the United States or Australasia and an old country like England. In the former agricultural wages are higher than in England, and almost every sort of employment, subject, however, to some qualifications, such as length of day and continuity of employment, is better paid than in England; but it is a *non sequitur*, not at first apparent, that the average earnings all around are also higher, the truth being that owing to the larger proportion of artisan classes in England the average earnings of the working classes may be as high or higher in England than in the United States, or at any rate not very far short. The mode of comparing wages in two countries is thus a most critical question. I have been often puzzled myself to explain how it is that we arrive in England at comparatively high figures for the aggregate income of the nation when most of the rates of wages are apparently so much lower — employment for employment — than they are in the United States or Australasia, and to a large extent I believe the solution I have now suggested is the true one. It is not enough, then, to compare employment with employment, but mass must be compared with mass.

Other dangers in these international statistical comparisons, such as differences in the purchasing power of money in different places, may be suggested. But I should not be disposed to lay so much stress on any other point as upon that of the relative importance of different employments in different countries. In these days of cheap freights and rapid transit, the equalization of prices in all countries has been carried very far indeed, the most important differences that remain being, I believe, artificial, arising from the protection of food products in countries like Germany and France, and the like causes. The different distribution of populations according to employments remains, however, an enduring cause of differences in their relative aggregate earnings and average earnings per head.

Finally, I have some remarks to make on the dangers of comparisons between nations as to their aggregate wealth.

Apart from all other difficulties that of the data themselves is here very great. It is hardly possible to obtain an account of the wealth of any country on any basis that can give a minutely accurate result, and it is the more difficult to obtain such accounts for any two nations made up in exactly the same way. If one country, therefore, is made out to have an aggregate wealth of about £250 per head, and another £300 per head, it may well be that, owing to the necessary want of exactness in the calculation itself for any country, and the differences of method employed in each case, the facts represented by these figures may either be much the same, or the country whose wealth is computed at the smaller figure may really be the richer of the two. Before any comparisons can be made at all, then, the methods observed in each case must be carefully followed, and particularly it must be observed whether they are likely to give a rack valuation or not. My own impression is that, except where the differences are enormous by almost any method of calculation, but little can be made of differences between country and country. Figures that are within sight of each other as much as are £250 and £300 per head, provided much the same methods have been followed, are practically much the same thing.

The comparison, also, is of little value unless accompanied by statistics of relative income, statistics of the sources of the wealth or income, and the like information. Accumulated wealth is only one element of economic strength.

A special point of great difficulty is how to deal with the wealth of a community which includes individuals having large investments abroad, and with the wealth of another community which is indebted to persons resident abroad in its public capacity, and whose individual members are also indebted to members of other communities. To a certain extent the foreign investments of a community in the first case are not available resources. Suppose the investments to be made in a foreign country with which it goes to war, the whole resources which are counted part of its wealth would really count on the other side. In the same way a country which has borrowed largely has the whole wealth really available for many purposes without any deduction for what it has borrowed. In war with a community from which it had borrowed this would at once be apparent, but in other contingencies, also, the indebtedness is not a real deduction, the wealth belonging to the foreign non-resident never being really taxable as if

he were resident. I have thought it expedient in my own calculations of the wealth of the United Kingdom to include the foreign investments of the members of the community at home as far as possible, and similarly I would make a deduction in the case of an indebted community equal to the amount of its indebtedness. All this, however, would be on the assumption of a continuation of peace, and subject to the qualifications that in certain circumstances a different calculation would practically require to be made.

There is one point in addition to be noticed in regard to the method of these calculations. Where property in two countries appears to be subject to a tax like probate duty or income tax on apparently much the same basis, the temptation is very strong to apply the calculated amount of such property per head to each nation respectively, but nothing could be more dangerous owing to the difficulty of the data. The laws and their administration of the respective countries compared would need careful examination before any such short cut could be used, and even then one ought not to be too sure of any single method. Unless some detail could be given, no such method should be employed except as a check on a more detailed method. Such a method is also specially dangerous when the wealth of a community is arrived at without any items being given; by such a method, for instance, as that of dividing the average wealth subject to probate duty in a year by the numbers dying in a year, assuming the wealth per head thus arrived at to be the average wealth per head of the community, and then multiplying the numbers of the community by that figure so as to arrive at the aggregate wealth. The method may yield useful results if care be taken to establish *aliunde* what is the relation between the wealth per head of those members of a community who die within a year and the wealth per head of the members of a community as a whole, but when no such care is taken, and communities are compared whose probate and income tax laws are not really the same, the result of the comparisons may be the merest chance.

CONSTITUTION

OF THE

AMERICAN STATISTICAL ASSOCIATION.

ARTICLE I. This Association shall be denominated the **AMERICAN STATISTICAL ASSOCIATION**.

ART. II. The objects of the Association shall be to collect, preserve, and diffuse statistical information in the different departments of human knowledge.

ART. III. The Association shall be composed of Fellows and Honorary Members.

ART. IV. All members shall be chosen by ballot; nomination for membership shall first be submitted to the Board of Directors; if approved by them, the names shall be presented to the Association, and for election the affirmative votes of four fifths of the members present shall be necessary. Each Fellow shall pay annually two dollars, or twenty dollars at some one time.

ART. V. Fellows only shall be entitled to vote, but Honorary Members shall have the right to sit and deliberate in all the meetings of the Association.

ART. VI. The officers of the Association shall be a President, five Vice-Presidents, a Recording Secretary, a Corresponding Secretary, a Treasurer, a Librarian, and three Counselors, who, together with the President and Secretaries, shall form a Board of Directors for the government of the institution, three of whom shall constitute a quorum at any meeting regularly convened. There shall be also three Standing Committees of three members each, namely, on Publication, on Finance, and on the Library.

ART. VII. The Association shall meet in the city of Boston, on the third Friday in January, April, and October, and at such other times as the Board of Directors shall appoint. At the annual meeting in January, the Association shall hear reports of the Board of Directors, of the Treasurer, of the Librarian, and of the Standing Committees, elect officers, and transact other business. Vacancies may be filled at any regular meeting. Five members shall be necessary to form a quorum for transacting business and the election of members, but a less number may adjourn the meeting.

ART. VIII. No alteration in this Constitution shall be made except on notice at a previous meeting, and by a vote of three fourths of the members present.

NOTE.— Each member shall be entitled to receive all reports and publications of the Association.

AMERICAN STATISTICAL LIBRARY.

The American Statistical Association possesses a Statistical Library, the result of forty years' collection, which is designed as a depository for statistical works of every nature. At present the Library is placed in rooms 31-33, Rogers Building, Massachusetts Institute of Technology, Boston. Its collection embraces not only the publications of the United States, but also many valuable reports issued by Statistical Bureaus of foreign countries. It also includes the very valuable statistical library collected by the former President, Dr. Jarvis, and bequeathed to the Association upon his death, in 1884. It is believed that the collection and preservation of reports which admit of a classification according to statistical groupings, will be of great public service, and the Association therefore earnestly requests a generous co-operation in still further enlarging the library in such directions.

Reports of vital and social statistics, registration reports, census documents, municipal reports, documents relating to public works, reports of trade, commerce, taxation, finance, insurance, industry, labor, health, crime, education, and religion are especially desired. Due acknowledgment of all donations will be given, and, when practicable, an exchange with the Publications of the Association will be made. It is especially desired that members of the Association will contribute copies of their writings.

For further information address

DAVIS R. DEWEY, *Secretary*,
Institute of Technology, Boston.

QUARTERLY PUBLICATIONS OF THE AMERICAN STATISTICAL ASSOCIATION.

- I. THE ESTABLISHMENT OF AN IMPERIAL COMMISSION FOR LABOR STATISTICS IN GERMANY. BY CARL C. PLEHN.
 - II. FRENCH STATISTICAL PUBLICATIONS. BY CHARLES D. HAZEN.
 - III. SKETCH OF LIFE OF ROBERT W. WOOD, M.D. BY JOHN WARD DEAN.
 - IV. REVIEWS AND NOTICES: EARNINGS OF WOMEN IN MICHIGAN, *Lucy M. Salmon*; EFFECT OF OCCUPATION ON HEALTH, *S. W. Abbott*; INFLUENCE OF OCCUPATIONS UPON MORTALITY, *W. Z. Ripley*; FERTILITY OF MARRIAGES IN PRUSSIA ACCORDING TO THE RELIGIOUS CREEDS OF THE CONTRACTING PARTIES, *G. N. Calkins*; THE FRENCH POPULATION, *W. Z. Ripley*; THE GEOGRAPHICAL DISTRIBUTION OF SEXES, *G. N. Calkins*; EFFECT OF PARENTS' AGE ON VITALITY OF CHILDREN, *G. N. C.*; THE FALL OF THE RATE OF INTEREST AND ITS INFLUENCE ON PROVIDENT INSTITUTIONS, *Francis Walker*; LIMITATIONS OF STATISTICS, *Stephen F. Weston*; SUICIDES IN THE AUSTRIAN ARMY IN THE YEARS 1873-90, *G. N. C.*; TEN YEARS' GROWTH OF THE CITY OF LONDON, *C. F. A. Currier*; WORK OF THE STATISTICAL SEMINARY AT THE UNIVERSITY OF VIENNA, *Victor Rosewater*; LOCAL PUBLIC RECORDS OF MASSACHUSETTS, *G. N. C.*; THE CRIMINAL STATISTICS OF BUENOS AYRES, *L. P. Lane*; THE AVERAGE LENGTH OF LIFE IN FRANCE, *G. N. Calkins*.
 - V. NOTE FROM MR. FRANCIS GALTON TO MR. GEORGE K. HOLMES ON THE SUBJECT OF DISTRIBUTION.
 - VI. REGISTRATION REPORT OF MASSACHUSETTS. G. N. C.
 - VII. NECESSITY OF REVISION OF THE CLASSIFICATION AND NOMENCLATURE EMPLOYED IN THE VITAL STATISTICS OF MASSACHUSETTS. BY S. W. ABBOTT.
-

BOSTON:
AMERICAN STATISTICAL ASSOCIATION.
1892.

COPYRIGHTED, 1892, BY AMERICAN STATISTICAL ASSOCIATION.

CONTENTS.

I. THE ESTABLISHMENT OF AN IMPERIAL COMMISSION FOR LABOR STATISTICS IN GERMANY. <i>By Carl C. Plehn.</i>	213
II. FRENCH STATISTICAL PUBLICATIONS. <i>By Charles D. Hazen.</i>	220
III. SKETCH OF LIFE OF ROBERT W. WOOD, M.D. <i>By John Ward Dean.</i>	232
IV. REVIEWS AND NOTICES.—	
Earnings of Women in Michigan. <i>Lucy M. Salmon.</i>	235
Effect of Occupation on Health. <i>S. W. Abbott.</i>	238
Influence of Occupations upon Mortality. <i>W. Z. Ripley.</i>	241
Fertility of Marriages in Prussia According to the Religious Creeds of the Contracting Parties. <i>G. N. Calkins.</i>	244
The French Population. <i>W. Z. Ripley.</i>	248
The Geographical Distribution of Sexes. <i>G. N. Calkins.</i>	251
Effect of Parents' Age on Vitality of Children. <i>G. N. C.</i>	254
The Fall of the Rate of Interest and its Influence on Provident Institutions. <i>Francis Walker.</i>	255
Limitations of Statistics. <i>Stephen F. Weston.</i>	259
Suicides in the Austrian Army in the Years 1873-90. <i>G. N. C.</i>	264
Ten Years' Growth of City of London. <i>C. F. A. Currier.</i>	265
Work of the Statistical Seminary at the University of Vienna. <i>Victor Rosewater.</i>	266
Local Public Records of Massachusetts. <i>G. N. C.</i>	267
The Criminal Statistics of Buenos Ayres. <i>L. P. Lane.</i>	268
The Average Length of Life in France. <i>G. N. Calkins.</i>	269
V. NOTE FROM MR. FRANCIS GALTON TO MR. GEORGE K. HOLMES ON THE SUBJECT OF DISTRIBUTION.	271
VI. REGISTRATION REPORT OF MASSACHUSETTS. <i>G. N. C.</i>	273
VII. THE NECESSITY OF A REVISION OF THE CLASSIFICATION AND NOMENCLATURE EMPLOYED IN THE VITAL STATIS- TICS OF MASSACHUSETTS. <i>By S. W. Abbott.</i>	279

AMERICAN STATISTICAL ASSOCIATION.

NEW SERIES, No. 20.

DECEMBER, 1892.

THE ESTABLISHMENT OF AN IMPERIAL COMMISSION FOR LABOR STATISTICS IN GERMANY.

BY CARL C. PLEHN, PH.D.

Until very recently little attention has been given, in Europe, to the establishment of special bureaus for the collection of labor statistics. In England the Labour Bureau of the Board of Trade dates only from 1886,¹ although special parliamentary and crown commissions have from time to time investigated different phases of the "Labor Question." In Switzerland the Confederated Laborers have since 1887 been allowed a Secretaryship for Laborers, part of the expenses of which are paid from the national treasury. It was only last June that France established her *Office du travail*, and Italy, though discussing the matter, has not to my knowledge taken any final step.

It would, however, be incorrect to conclude that no statistical material was to be had from these countries relating to the condition of the laboring classes, for, on the contrary, much has been furnished by other statistical bureaus. So vitally are the questions which concern the laborer connected with all problems of social organization that this is unavoidable.

¹ *Publications of the American Statistical Association*, June, 1890, p. 271.

The regular census enumerations give us comparisons of the laboring class with the whole population, of trade with trade, and of skilled with unskilled, in point of numerical strength. This of itself is an important piece of labor statistics. The census gives also the size of families, condition as to wedlock, dwellings, etc. The regularly collected statistics of the movement of population is another very valuable source of such information. A still closer approach to the field of labor statistics is made in the statistics of Industries (*Betriebsstatistik*), meaning by industries every place of employment of labor, agricultural or manufacturing, large factory or small shop. This comes nearest to being labor statistics, in the narrower sense, when the characteristics which are made the basis of the inquiry are chosen not with reference to the amount of their product, but with especial reference to the light they may throw on the condition of the laborers employed. For example, the agricultural laborer is quite a different man when employed on a large farm with machinery and a large number of co-laborers than when he "farms it" alone on an acre or two. The cobbler who makes shoes only occasionally as an adjunct to his regular business of repairing is very differently situated from the operator who sews a Goodyear welt by machinery in a large factory. And these distinctions are generally recognized in collecting statistics of industries.

What, then, do we mean by labor statistics? And what is the special field for a Bureau of Labor Statistics? The distinction is not so much one of material as it is one of point of view. It is the social problem viewed from a special standpoint.¹ It is the business of the statistician in this case to ascertain how those persons are situated who live entirely or principally from the wages of their toil. It is, now, a question of classification, of separating the whole population into groups, and putting the laboring class by itself in con-

¹ Cf. v. Inama-Sternegg. *Arbeitsstatistik*. In *Statistische Monatschrift* (Austrian), Vienna, xviii, 2, March, 1902.

trast to the others. For this purpose we have to investigate wages (form and amount), the quality of the labor, the hours of labor, the standard of living, the operation of factory laws, the mobility of the laborer, etc., and there are questions which demand a more direct and individualistic treatment, case by case, than they could have in any general census or industrial statistic.

And, secondly, it is the statistician's duty here to investigate the effects on society, as a whole, of the conditions thus imposed on the laboring class. We have to consider that class not so much as an important agent in production as an element of the total population, and whose well or ill being will reflect on the whole of society.

While it is clear, then, that the census returns, the statistics of movement of population, of industries, of immigration, of crime and pauperism, and many others, may not improperly be said to be the basis of all labor statistics, yet it is none the less clear that there is a limit beyond which they cannot well go. If, for example, we should attempt to unite some of this work with the census, what would be the result? To be sure, to increase the length of the schedule would entail but little additional expense and labor, so far as collection alone is concerned, but it would militate seriously against the accuracy of the results attained. To approach the individual with more than twelve or fifteen questions arouses opposition and leads to confusion in the replies. Moreover, the work of verifying, collating, and formulating the results of more numerous inquiries is vastly increased, as the number of possible combinations becomes greater.

As the result of considerations similar to the above, and in view of the ever increasing necessity from political considerations, of having reliable and complete statistics of labor, a movement has begun in Europe for the establishment of special bureaus. Some of these are enumerated in opening. No line of investigation in the whole field of sociology strikes more directly at the very tap-roots of the social problems than this investigation of the conditions of labor.

It is very strange that Germany, otherwise always so ready to favor and further a scientific treatment of important questions, should be almost the last to come into line and establish a special bureau for labor statistics, and does so even now in an extremely half-hearted and meagre fashion.

The history of the movement, which now bids fair to bear some fruit in the establishment of an Imperial Labor Commission, may be briefly summarized as follows:¹ In 1868 the Social Democrats proposed, in the Reichstag of the North German Confederation, the establishment of a parliamentary commission, modelled after the English, for the investigation of the situation of the laboring class, and to aid in formulating reforms. In the greater interests of the time, centering in the changes in the constitution, this proposal, although it had apparently met the approval in principle of all political parties, was never acted upon. The question was not brought up in Parliament again until 1885. Meanwhile, since 1878, the reports of the factory inspectors formed a valuable, though by no means sufficient, source of information on labor statistics. In 1885, on the occasion of a revisal of the laws regulating industry (*Gewerbeordnung*), the Social Democracy brought forward two conjoined propositions, one for the official collection of wage statistics, and another for the establishment of labor bureaus, which should, besides executing other functions, collect labor statistics. On this no action was ever taken. In May, 1890, the same party brought forward two separate propositions, of a similar nature, and, almost at the same time, Representative Siegle (National Liberal) introduced a bill looking in the same direction. The proposition of the Social Democracy did not reach its first reading until December, 1891. It passed the first reading without much opposition, but the close of the session prevented the second and third readings. Siegle's bill was, however, adopted by the Reichstag in January, 1892. The

¹ Cf. Braun, *Die Errichtung einer Kommission für Arbeiterstatistik*. In *Archiv für Sozial Gesetzgebung und Statistik*. Bd. v. Heft 1.

execution of Siegle's plan,¹ which, though very comprehensive in its general outlines, was not well worked out in the details, was prevented by the creation of a Commission for Labor Statistics, by the Bundesrath. The *Regulativ* for this commission came down to the Reichstag last March, and falls far short of realizing the hopes of those most interested in the establishment of an effective Labor Bureau.

The Commission is, so runs the *Regulativ*, established to assist, by collecting statistical information, in the carrying out of the industrial laws (*Gewerbeordnung*); this relates solely to manufacturing industries, agriculture not being included. It consists of 13 members. The chairman and one other member are appointed by the Chancellor, the latter to be from the official staff of the imperial statistical office (*des k. k. statistischen Amtes*). The Bundesrath elects five and the Reichstag six. The appointed members hold office five years, the elected for the life of the Reichstag. The duties of the commission, subject to the instruction of the Chancellor and Bundesrath, are: (1) to consider the advisability of undertaking statistical inquiries, the method of collection, and to formulate the results; (2) to lay before the Chancellor propositions for the above purposes. The Commission has the right to add to its body, in equal numbers, employers and employes, who shall be allowed to speak on the proceedings, and in case the statistics collected need explanation they may call witnesses. Employers and employes must be called when the Bundesrath or the Chancellor demand it. The commissioners are unpaid, but expenses are to be reimbursed, and, in the case of laborers, expenses shall be construed to cover wages lost by loss of time. The Commission can only meet when called by the Chancellor, or by his permission. The Chancellor and each State of the Empire have the right to be heard before the Commission.

Two things at once strike the reader of this *Regulativ*:

¹ Cf. Wörlshoffer, *Die Aufgaben der Reichskommission für Arbeiterstatistik*. In Schäffle's *Zeitschrift f. d. gesamte Staatswissenschaft*, xlviii, 3, 1892.

(1) That the Commission is expressly organized for a certain and limited object; the investigations are only to further the carrying out of existing laws. Its work, then, will depend largely on the needs of the government in executing those laws; it can strike out in no independent line. (2) The majority of the commissioners are representatives of the government. The Bundesrath and Chancellor appoint or elect seven members out of the thirteen directly, and if the parties in the Reichstag are fairly represented, from two to three more will be of the government's party. There is then no thought of creating an independent, impartial, scientific bureau. This course is directly in the face of all precedents in other countries. At least, the ostensible intention in the establishment of the twenty-one state labor bureaus, and the national bureau in the United States, has been to make the office independent. The same is true of the other labor bureaus and commissions in Europe, as mentioned above. The parliamentary commissions in England, after which the German commission is apparently modelled, are preëminently impartial. This parallel with the English committees goes farther, in that the Commission can summon employers and employes, and call witnesses. But here the comparison stops, for the proceedings of the English committees are public, and volunteered testimony is gladly heard. The German bureaucratic traditions will allow, of course, of only private sittings.

It must not be forgotten, too, that the commission in which the government has taken such pains to secure a majority, is yet absolutely subject to the control of the Chancellor; can only act by his permission, and even with that permission the limit of its power is reached when it considers the advisability of certain investigations. The *Regulativ* does not define which department of the government is to carry out the investigations when recommended by the Commission and approved by the Chancellor. Presumably, this duty would devolve on the imperial statistical office, an office which, if

we may trust the views of its director, Dr. H. von Scheel, as expressed in the *Allgemeine Zeitung* (Munich), Sept. 18, 1890, is entirely inadequate to cope with so serious a problem.

The usefulness, then, of this new Commission for Labor Statistics will depend entirely on the attitude of the government toward it. It, of course, remains within the power of the Chancellor and Bundesrath to give the Commission such scope and freedom that it can grow to an active, useful body. It is, however, much to be feared that, according to the general run of German politics, the Commission will sink into an obedient, applauding echo of the Chancellor's opinions. It is to be hoped that the interest attaching to the matters which fall to it for consideration will prevent its suffering the fate which overwhelmed the Prussian Central Statistical Commission, a body which, though it had originally much more autonomy than the Labor Commission, has not even met for many years. An extension of the Commission's functions, so as to apply to agricultural labor, is also needed. At present they cover only the laborers affected by the *Gewerbeordnung*. Why the agriculturalists were omitted was not made clear at the time of the adoption of the *Regulativ*.

It is to be hoped that this Commission will be the entering edge of the wedge, and that a more effective bureau may be later established. Certainly, in view of the growing political power of the laboring class in Germany, it would be wise to have their interests disinterestedly studied.

Middlebury College, Vermont.

FRENCH STATISTICAL PUBLICATIONS.

BY CHARLES D. HAZEN.

The gathering of statistics in France began to assume some importance toward the close of the Old Régime, but it is only more lately, under the Second Empire and the present Republic, that they have been treated in some measure as a science, and their preparation and periodic publication have come to be an important branch of governmental activity. In this article an endeavor is made to show the range of the statistical publications of the different departments of the French government. There is an important class of works carried on by private associations, learned societies, etc., and appearing with more or less regularity, which are of undoubted scientific value to the statistician. The number and importance of the regular official publications have, however, precluded my attempting a description of these in the present article; and even of some of the official publications of minor importance I have been compelled to give simply the name without description. I have also added a brief statement of the statistical publications of the city of Paris as being of too great importance to be entirely omitted in a study like the present.

MINISTRY OF COMMERCE, INDUSTRY, AND THE COLONIES.

This Ministry issues a large number and many of the most valuable statistical publications of France. Among these may be mentioned the following: —

Moniteur officiel du commerce. Appears weekly.

Résultats statistiques du dénombrement.

Statistique de la France. First series, 1837–52; second series, 1855–72; third series, 1874–92.

Annuaire statistique de la France, 1878–92. 15 vols.

Bulletin consulaire français. Begun in 1876.

Annales du commerce extérieur. Begun in 1843.

Statistiques coloniales.

Statistique des primes à la construction et à la navigation.

The *Moniteur* is a weekly journal dating from 1883, and contains varied information relative to commerce, industry, and navigation, such as extracts from French consular reports, reports from French and foreign chambers of commerce, French and foreign commercial legislation, imports, exports, etc. The general results of the census appear every five years in the second title given above. The *Statistique de la France* is the name given to three series of publications dating from 1835, and comprising now some fifty volumes. At present a volume appears yearly, and gives statistics relating to the population, as marriages, births, deaths; statistics concerning the centers of population, relating to tolls, consumption of the large cities, workmen's salaries, public institutions, such as hospitals, asylums, pawnshops; also agricultural and industrial statistics.

Perhaps the most important of all French statistical publications is the *Annuaire*, a thick book of 600 pages, now in its fifteenth year, and reproducing, upon as uniform a plan as possible, statistical documents of every sort emanating from the different ministries, and many of which also appear in other official publications. The scope of the work is revealed by the headings of its different parts: territory and population, movement of the population, religion, criminal justice, civil and commercial justice, penal institutions, charitable institutions, public instruction, fine arts, agriculture, industry, commerce, navigation, fisheries, electoral and military statistics, finances and imposts, Algeria and Tunis, colonies and French possessions. Under these different heads the totals of the year are compared with those of the four preceding years, while a résumé permits one to extend these comparisons from the very origin of these statistics down to the

present moment, thus constituting a veritable statistical history of France. Another of the more important publications of this ministry is the *Bulletin*, a monthly publication of some hundred pages, giving information as to the economic condition of the different countries of the world, the state of their industry, trade and navigation, and their commerce with France, etc. The *Annales* appear monthly, and contain the commercial legislation of the principal foreign countries, tariffs, commercial treaties, conventions, etc. This ministry also issues the volume *Statistiques coloniales*, an annual compilation of important material on colonial statistics. Census, mortality, commercial, educational, penal, financial, industrial statistics are set forth in this general exposé of the life and activity of the colonies. The *Statistique des primes*, published yearly, gives tables of the subventions awarded the merchant marine, of the encouragement extended sea fisheries, etc. Besides these statistical collections this ministry also publishes annually the following works:—

Situation économique de la France pendant les 15 dernières années.

Situation économique et commerciale des pays étrangers.

Statistique du personnel médical de la France.

Rapport sur les caisses d'épargne.

Rapport sur les opérations de la caisse des retraites pour la vieillesse.

Rapport sur les opérations de la caisse d'assurance en cas de décès ou d'accidents.

Rapport général sur les épidémies.

Rapport général sur le service des eaux minérales de la France.

Rapport de la commission permanente des valeurs de douane.

A descriptive catalogue of the machines and processes for which patents have been granted is published annually (*Description des machines et procédés pour lesquels des brevets d'invention ont été pris*, etc.).

MINISTRY OF THE INTERIOR.

The general census is taken every five years by this ministry, and is reproduced in detail in the *Recensement*.

This ministry publishes the following reports : —

Recensement quinquennal de la population par département, par canton et par commune.

Relevé des travaux des conseils de préfecture.

Statistique de l'émigration par les ports français.

Situation financière des communes et des départements d'après les budgets primitifs.

Situation matérielle et financière des communes d'après les comptes définitifs.

Compte rendu général des opérations effectués par le service vicinal.

Statistique triennale de l'Algérie.

Exposé de la situation générale de l'Algérie.

Rapport sur les services de l'administration pénitentiaire.

Rapport sur les opérations de secours mutuels.

La statistique sanitaire des villes de France.

Album de statistique graphique.

The emigration statistics appear triennially, and include tables indicating the number, the sex, the age, profession, place of embarkation and the destination of the emigrant. The object of this publication is to make known the ethnological and commercial importance of emigration, and to measure its effect upon the agriculture and industry of the departments furnishing the emigrants. The Ministry of the Interior furnishes abundant financial statistics concerning the communes, in various reports in the above list. Statistics relating to Algeria are published for the most part either in the *Statistique triennale*, or in the *Exposé*, which appears annually.

MINISTRY OF PUBLIC WORKS.

This ministry collects and publishes extensive statistical information concerning railroads, public highways, waterways, the exploitation of mines, the application of steam in the economic life of the nation, as in factories, locomotives, steamboats, etc. In the number and variety of its statistical publications, this ministry vies with the Ministry of Commerce. Among these may be mentioned : —

Le répertoire méthodique de la législation de la navigation et des routes.

Recensement de la circulation des routes nationales.

Résultats généraux d'exploitation des tramways.

Etat de la longueur des routes nationales.

Etat itinéraire des routes nationales.

La statistique de la navigation intérieure.

The first of these contains all legislation affecting circulation upon the land or water routes. The second is a work appearing at irregular intervals, showing the amount and the nature of the circulation upon the public highways.

Perhaps the most important statistical labors of this ministry are those concerning railroads. These statistics began in 1858, when a statistical history of French railroads, from 1823 to 1855, appeared under the title *Documents statistiques sur les chemins de fer*. Nothing further appeared until 1863, when the regular annual publication of the *Situation des chemins de fer français* was begun. In 1869 a new series of railroad statistical documents was undertaken called *Statistique des chemins de fer français*. This appears now at the close of each year, and contains detailed information about the condition of the grants, a statement of the property of the different railroads, a résumé, by line, of expenses and receipts, of the circulation of travellers, of the transportation of merchandise, and also full statistics of Algerian and colonial railways. Owing to the great development of the railway system of France, and to the increased statistical material brought together in the annual publications, the preparation and printing of these works demand so much time that they gain publicity only some years after the period which they cover. To meet the demand for immediate information the more important matter is published in the *Statistique des chemins de fer français, documents principaux*. Other statistical publications of this class are:—

Répertoire méthodique de la législation des chemins de fer français.

Résumé, par ligne, des dépenses de premier établissement et des résultats de l'exploitation.

Bulletin comparatif des recettes des chemins de fer (great lines).
Chemins de fer français d'intérêt général. Recettes de l'exploitation. (Monthly.)
Chemins de fer français d'intérêt local. Résultats de l'exploitation. (Quarterly.)
Ouvertures, concessions, et déclarations d'utilité publique.

The first of these contains all legislation affecting railways. In the second are given the number of kilometers exploited, the subventions awarded by the state, and the receipts and expenses of the great lines.

Other important publications emanating from this ministry are : —

Statistique de l'industrie minérale et des appareils à vapeur en France et en Algérie.
Statistique de l'industrie minérale. Production des combustibles minéraux, fers, fontes, et aciers.
Statistique des sources minérales de la France.

This ministry has also published —

Album de statistique graphique.
Atlas des ports étrangers.
Atlas des canaux.

The first of these contains exhaustive statistics upon the mineral industry of the country, including the results of the exploitation of the mines, quarries, peat-beds of France, the number and the salaries of the miners, the production by department and by basin, the number of accidents occurring in the mines; statistics upon the use of steam machinery, upon the accidents caused by steam, etc. In the third the yield of the mineral springs of France is given.

MINISTRY OF FINANCE.

This ministry has for a long time gathered statistics, as indeed the necessities of taxation have compelled it to do. The Customs Department, for instance, has a statistical past

of considerable age. But financial statistics entered upon a new era in 1877, when M. Léon Say created a Bureau of Statistics and Comparative Legislation, and established a monthly bulletin by means of which this bureau might communicate with the legislature and the public. This bulletin gives immediate publicity to the more important labors of the bureau. The chief publications relating to the budget are : —

Projets de lois portant fixation des budgets.

Comptes généraux de l'administration des finances.

Comptes définitifs des recettes.

Comptes définitifs des dépenses.

The Ministry of Finance also publishes the following commercial statistics : —

Tableau général du commerce de la France avec ses colonies et les puissances étrangères.

Tableau décennal du commerce de la France avec ses colonies et les puissances étrangères.

Tableau général des mouvements du cabotage.

Compte, en matières et en deniers, de l'exploitation du monopole des tabacs.

Tarif officiel des douanes de France.

The first of these is an annual publication of seven hundred folio pages, in which are found a general résumé of imports and exports; summaries classed by importing and exporting countries, according to the nature of the product or merchandise, and according to ports of entry and departure. Statistics are inserted upon the cod and herring fisheries, upon the effective force of the French merchant marine, etc. The *Tableau décennal* treats of much the same subjects, but in a condensed form and covering a longer period. By comparisons made with the previous decennial publications, information is given concerning French commercial activity during a period of sixty years. The third publication gives statistics relating to the coasting trade; the fourth furnishes extensive

information about the tobacco trade, a government monopoly in France. The tariff laws, customs regulations, commercial treaties of France, appear in the *Tarif officiel*.

The National Mint publishes an annual report. The Ministry of Finance has made some very important contributions to statistical knowledge by different investigations it has conducted, as one in 1878, *Sur la circulation métallique en France*; in 1879, *Sur les boissons*, etc.

MINISTRY OF WAR.

The chief publications of the Ministry of War are: —

Compte rendu sur le recrutement de l'armée.

Compte de l'emploi des crédits affectés à l'inscription des pensions militaires au Trésor public.

Compte général de l'administration de la justice militaire.

Statistique médicale de l'armée.

The first shows the distribution of the recruits among the different divisions of the army and navy, their physical development, their education, and occupation; the exemptions from service granted, voluntary engagements, reëngagements, etc. The second contains complete pension statistics. The third of these publications shows the crimes and misdemeanors of the soldiers, punishments imposed, etc. The prisoners are considered with reference to the division of the army to which they belong, to their rank, grade, time of service, and education.

MINISTRY OF MARINE.

The publications of the Ministry of Marine are: —

Notices statistiques sur les colonies françaises.

Notice sur la transportation à la Guyane française et à la Nouvelle-Calédonie.

Compte général de l'administration de la justice maritime.

Statistique des pêches maritimes et de l'ostréculture.

The first contains very general legislative, financial, statistical, and historical information about the different colonies.

The second furnishes data as to the number of convicts in the penal institutions of these two colonies, their crimes, punishment, convict labor, prison schools, sanitary condition, etc. The last is a statement of the sea fisheries and of fish culture.

MINISTRY OF PUBLIC INSTRUCTION.

This ministry printed in 1868 a large folio volume, *Statistique de l'enseignement supérieur*, containing abundant statistical information upon the different faculties of the University, the higher technical and scientific schools, different literary and scientific institutions, such as the Institute, College of France, *Ecole des Chartres*, public libraries, free lecture courses, etc. It publishes at irregular intervals a *Statistique de l'enseignement secondaire*. The latest volume appeared in 1889 and covered the years 1876-87. It furnished varied statistics upon higher education, general condition of the lycées, communal colleges, normal schools, their financial status, educational work, etc.

Further statistics concerning education are found in —

Statistique de l'enseignement primaire.

Statistique de l'enseignement primaire supérieur.

Résumé des états de situation de l'enseignement primaire.

Enquêtes et documents relatifs à l'enseignement supérieur.

These *Enquêtes* are a considerable series of reports (now forty, more or less) published at irregular intervals and bearing upon different phases of higher education.

MINISTRY OF AGRICULTURE.

This ministry publishes the *Statistique agricole annuelle*, which gives the yield of the different agricultural products, statistics upon prices, upon the consumption of Paris, and the importation and exportation of agricultural produce. The *Etats des récoltes des céréales*, covering the period from 1816 to 1876, and the *Etat définitif des récoltes*, published annually since then, furnish an uninterrupted series of agri-

cultural statistics from 1816 to the present day. In 1872 appeared the *Prix moyen et annuel de l'hectolitre de froment, 1800-1871*.

The Bulletin of this ministry appears eight times a year, and contains official documents, budgets, laws, statistics of animal diseases, of the importation and exportation of cattle, of the harvests, prices of bread, meat, etc., by departments, as well as other agricultural information.

This ministry also publishes —

Etat approximatif de la récolte en blé, seigle, et méteil.

Poids officiel des grains.

Récolte de la soie.

The Ministry of Agriculture has published beside statistical documents, properly so-called, (1) a series of volumes called *Primes d'honneur*, a collection of monographs upon agricultural subjects, and (2) the results of two important agricultural investigations, the first appearing in 1866 in ten volumes, the second in 1879 in two volumes. The Forestry Commission, annexed to this ministry, published in 1878 a *Statistique forestière*, with atlas.

MINISTRY OF JUSTICE.

The Ministry of Justice publishes its statistics in two chief collections: —

Le compte général de la justice criminelle.

Le compte général de la justice civile et commerciale.

The former is a detailed statement of the labors of the criminal courts, the latter of the labors of the courts of appeal, of the various civil and commercial tribunals, councils of arbitration, etc.

MINISTRY OF POSTS AND TELEGRAPHS.

This ministry publishes: —

Statistique sur le mouvement des correspondances postales.

Bulletin. (Monthly.)

Rapport sur les opérations de la caisse nationale d'épargne.

Postal statistics are also inserted in the —

Annuaire statistique de la France.

Annales du commerce extérieur.

Statistique générale de l'Algérie.

Annuaire statistique de la ville de Paris.

MINISTRY OF FOREIGN AFFAIRS.

The Ministry of Foreign Affairs publishes no statistics. It receives the reports of consuls and transmits them to the Ministry of Commerce, which publishes them at length or in extracts in the *Annales du commerce extérieur* and in the Consular Bulletin.

CITY OF PARIS.

The city of Paris issues some very valuable statistical publications. The *Recherches statistiques sur la ville de Paris et le département de la Seine* is a very important collection of statistics in six volumes, covering the period 1816–56. From 1856–64 the statistical documents of Paris were not published, or, at most only partially, as in the Statistical Annual of 1880. The *Bulletin de statistique municipale de la ville de Paris* is a monthly publication which appeared from 1865–79. Since 1879 two new series of statistics have appeared,—

Annuaire statistique de la ville de Paris.

Bulletin hebdomadaire de statistique.

The former contains varied information interesting to the administrator, the economist, and the doctor. The weekly Bulletin is intended to give immediate publicity to all the information which the public needs to have without delay. Statistics interesting the economist, such as the business of the markets, the condition of savings banks, city hospitals, charitable institutions, etc., are published in a —

Tableau mensuel de statistique municipale de la ville de Paris.

Another city publication of importance is —

Résultats statistiques du dénombrement pour la ville de Paris et renseignements relatifs aux recensements antérieurs.

Almost all the chief departments of the municipal administration publish volumes entitled *Budget et compte*, which contain much statistical information.

Nearly all of the 86 departments publish annuals. A certain number of cities publish weekly journals containing sanitary and meteorological statistics. Such are Amiens, Toulouse, Bordeaux, Marseilles, Toulon, Nantes, Nice, Nancy, Rheims, Le Havre, etc. Le Havre, Nancy, and Rheims also publish very complete and valuable annuals.

CHARLES D. HAZEN.

Johns Hopkins University.

SKETCH OF THE LIFE OF ROBERT W. WOOD, M.D.

BY JOHN WARD DEAN, A.M.

Presented to the ASSOCIATION at its Annual Meeting, Feb. 10, 1893.

Robert Williams Wood, an officer and benefactor of the American Statistical Association, died at his residence in Jamaica Plain, Boston, Mass., on the 4th day of January, 1892, in the eighty-ninth year of his age. He was the second son of Capt. Joseph and Mrs. Betsey (Williams) Wood, of Stow, Mass., where he was born April 22, 1803. In 1808, when he was about six years old, the family removed to Augusta, Maine. Here Robert received his early education at the public schools. His father inherited a moderate fortune, but was unfortunate and lost it, so that Robert from an early age was forced to depend upon his own exertions for his support. When he first conceived the idea of obtaining an education he asked his mother's advice. She told him she could not advise him in this matter. Others had obtained an education under similar circumstances, and if he dare venture she advised him to undertake it. He did venture, prepared himself for college, and entered Waterville College, now Colby University. While pursuing his studies here he taught a district school to obtain money to pay his expenses. He was graduated in 1829, and left college little in debt.

After graduating at Waterville he began the study of medicine at Augusta, Me., under the instruction of Dr. Cyrus Briggs of that town. He then attended three courses of lectures at the Medical School of Maine connected with Bowdoin College, Brunswick. Subsequently he went to Boston, Mass., and attended medical lectures there. In 1832 he completed his studies and received the degree of M.D. from Bowdoin College.

He took him a wife from a family in good standing in Machias, where he had taught school while in college. He began the practice of medicine at Aurora, Me., and was successful in his profession. The next year a physician was wanted in Orono in the same state in the vicinity of Bangor. Dr. Wood removed there and established a good practice. Here he resided till 1838, when he sailed for the Hawaiian Islands. His sister, Charlotte Augusta, wife of William Coffin Little, had preceded him, and the accounts she gave of the delightful climate

induced him to try his fortunes there. He sailed from Boston on the 20th of October, 1838, and arrived at Honolulu on the 6th of April in the following year. He resumed immediately the practice of his profession. By appointment of the United States Consul, he was for ten years, from 1839 to 1849, physician of the hospital for American seamen at Honolulu. Having a mortgage on a sugar estate in the Island of Kauai, which had not been successful, he was obliged to give his personal attention to it, in order to save his property. For the purpose of becoming acquainted with the best mode of sugar raising, he made a visit to the plantations of Louisiana. For twenty years he was engaged in raising sugar-cane and the manufacture of sugar, in which he was a pioneer. He was the first person that was financially successful in the introduction of this industry into the Hawaiian Islands. He afterwards bought another estate on the island of Maui, and carried on both of the plantations till after his return to the United States in 1866. He withdrew from this business soon after, and from all business a few years later.

From 1872 till his death he resided at Jamaica Plain. The same year that he took up his residence here, 1872, he was elected a fellow of the American Statistical Association, of which his wife's uncle, Edward Jarvis, M.D., had been for many years president. He took much interest in the institution, and in 1873 he was chosen librarian, which office he held till 1883, when he was succeeded by Davis R. Dewey, Ph.D., the present librarian and secretary of the Association. He was counsellor from 1889 to 1890; a member of the publication committee from 1883 to 1888; and of the library committee from 1878 to 1887. He was also a member of the Hawaiian Club of Boston. This club, at its annual meeting, held on the 27th day of January, a few weeks after his death, appointed a committee, of which the Hon. James W. Austin, who was acquainted with Dr. Wood in Honolulu, was chairman, to convey to the family their sense of the loss they had sustained by his death. In their communication they say: "He was one of our original members, and one of our most valued associates. His presence was always most welcome at our meetings. He endeavored to advance the interests of the club, and to promote its prosperity. We recognize his many estimable qualities as a man, and his faithfulness and loyalty as a friend. In the fulness of years he has left us after a life well spent in good and faithful service."

Dr. Wood married on the 4th of June, 1833, Delia, daughter of Samuel A. Morse, of Madison, Maine, for many years Collector of the United States Customs for the port of Machias, Maine, and afterwards at Eastport, in the same state. He married, secondly, on the 31st of October, 1864, Lucy Jane, daughter of Charles W. Davis, of Concord, Mass., by whom he had one son, Robert Williams Wood, Jr., born May 2, 1868. His widow is still living at Jamaica Plain, Mass., and his son is a graduate student and Honorary Fellow at the University of Chicago.

During his lifetime he was a liberal donor to the American Statistical Association. Other societies were also partakers of his wealth. At his death this Association received a bequest of three thousand dollars. Seventeen other educational, religious, charitable, and scientific institutions were remembered in his will, the aggregate amount of his public bequests being seventy thousand dollars.

He lived to a ripe old age, but was blessed with health and mental vigor in a remarkable degree. The death, even at an advanced age, of such a man, whose sterling integrity, good sense, and practical knowledge of affairs fitted him so well to be a useful member of society, and whose kindness of heart made him always a ready helper of his fellow-men, may be regarded as a loss to the community as well as to his relatives and friends. By this society his loss is especially felt. He was always ready to perform the duty assigned him, and to work unselfishly for the welfare of the Association.

In 1885 Dr. Wood prepared for the Statistical Association a Memorial of Edward Jarvis, M.D., who died October 31, 1884, at the age of eighty-one, and who had held the office of president of the Association for upwards of thirty years. The paper was read at the annual meeting, January 16, 1885, and was printed as an octavo pamphlet of 21 pages. Dr. Wood was also a contributor to various periodicals.

REVIEWS AND NOTICES.

EARNINGS OF WOMEN IN MICHIGAN.

Ninth Annual Report of the Bureau of Labor and Industrial Statistics. Henry A. Robinson, Commissioner of Labor. 1892. Lansing, Michigan. Pp. xvii, 472.

The last annual Report of the Michigan Bureau of Labor is a presentation of the condition of the wage earning women of the state, the amount of mortgages, and the number of property owners in the city of Detroit, together with miscellaneous statistics concerning strikes, criminal records, etc. The most important part of the Report is that treating of women wage earners, and is the only one here considered. It is the first time an exhaustive investigation of this subject has been made in Michigan, and for this reason, if for no other, the Report is worthy of consideration.

Fourteen manufacturing cities and towns in the state were visited, and information was secured concerning women in 137 industries. 129 questions were asked, classed as social, industrial, economic, and sanitary, while others related to hours of labor, dress, church attendance, and membership in societies. Thus a mass of interesting material has been collected in regard to the conditions under which women work, and it is in this that the real value of the Report consists, and not in the discussion of wages.

It is a matter of no small moment to stimulate among working women themselves a discussion concerning the sanitary conditions under which they work, the unhygienic features of women's dress, the possibility of saving wages, the value of organization, and the importance to themselves of statistical investigations of their work. The education of employers and employes is a legitimate, if not an expressed, object of a bureau of labor.

The results obtained in Michigan do not differ materially in fundamental principles from the results of similar investigations elsewhere. They show that women are underpaid and apparently paid less for the same work than are men; that they are able to save but little;

that hours of labor vary greatly in different industries, but that in similar industries the differences are not great; that the entrance of women into the industrial field has not only not impaired their health, but has even resulted in a positive gain to it in spite of the unsanitary conditions too often found,—the tables showing a marked improvement in health on the part of a majority of women since beginning work; that the majority of the wage earning women are of foreign birth or parentage; that child labor is not uncommon in spite of legal restrictions, or work prolonged to extreme old age; that the majority of workers are between 15 and 25 years of age, and have begun work between the ages of 14 and 18; that 83 per cent of women in the state work under home influences,—results similar to that obtained by the United States Commissioner of Labor in 1888, when it was found that 85.5 per cent of women in the cities investigated lived at home; that little organization exists among working women, and that as a class they are suspicious and unwilling to answer questions concerning their work.

Extreme care has apparently been taken to have the results obtained presented faithfully and accurately.

The Report must be criticised unfavorably in three particulars,—two of them incident to the recent entrance of women into the industrial field. First, it may at least be questioned whether any temporary or permanent advantage is gained by thus separating the work of women from that of general wage earners in the same industries. Women in manufacturing industries work side by side with men, and all questions concerning wages, hours of labor, sanitary conditions, apply as much to one class of workers as to the other. The one thing that will most help women as wage earners is to have their work and its financial results measured by the standards applied to other workers longer in the same fields. Second, the classification employed seems defective and irrational. An average wage is meaningless when it includes the wages paid (*a*) domestic servants, who receive personal expenses plus cash wages; (*b*) library cataloguers, whose work is largely technical; (*c*) companions, whose chief qualification is agreeableness; (*d*) music teachers, who require special natural endowments in addition to technical training; (*e*) proof readers, whose work is a special trade; (*f*) janitresses, whose qualifications are physical; and (*g*) cash girls, too immature to do any other work. If

to these be added occupations as varied in the qualifications demanded as are stenography, hair dressing, millinery, laundering, and the different forms of work in mills, factories, stores, and offices, it will be seen of how little value is the average result. An appreciation of this principle is seen in the exclusion from the average wage of the wages received by teachers and state employes, but its application should have been carried much farther. If a general average had been given of the wages received by persons engaged in production, distribution, personal service, etc., it would have seemed more reasonable. A general wage average is sometimes interesting when it includes the wages in the different departments of an industry where promotion is possible, but it is meaningless when it includes the wages paid skilled and unskilled labor in different industries where no possibility exists of passing from one industry to another.

The same defect is seen in the average hours of labor. In the general average are included the hours of (a) factory laborers, regulated by law; (b) employes in stores and offices, fixed by custom; (c) domestics, subject to the caprices of employers; (d) music teachers, florists, and mistresses of boarding houses, presumably optional.

Third, inasmuch as the general public has yet to be educated to consider statistical reports interesting and valuable reading, the presentation of statistical material in a clear, dignified, and fairly interesting manner is scarcely second in importance to that of securing reliable facts, collating them accurately, and interpreting them judicially. The majority of readers whose interest in statistics has yet to be won are repelled by the frequent use of "bulking," "totaled," "data" used uniformly as a singular noun, the not infrequent use of a plural subject with a singular verb and the reverse, "widow lady," such phrases as "the canvassers received different answers than, etc.," "every wage earner will be glad to answer full and free," and a score of inaccurate expressions too long to quote.

But far worse than this slovenly use of English — bad as it is — is its undignified use. "Grass widow" (p. 133), "gents" (p. 108), "a hustling city" (p. 183), savor of the street corner rather than suggest the highest industrial authority in a great commonwealth. Even if these can be excused on the score of haste, no apology seems possible for the use, page after page, of "fore-lady," "sales-lady," "reception-lady," "cloak-lady," and "fore-lady of the washroom";

nor for the statement that "lady canvassers went to the women wage earners in person" (p. 19).

Accuracy of mathematical work and grasp of statistical principles ought not to be incompatible with the presentation of a subject, if not in elegant, at least in not slovenly English.

LUCY M. SALMON.

Vassar College.

EFFECT OF OCCUPATION ON HEALTH.

The Effect of Occupation on the Health and Duration of the Trade-life of Workmen. 12th, 13th, and 14th Annual Reports of the Bureau of Statistics of Labor and Industries, of New Jersey, 1889, 1890, and 1891. Trenton, N. J.

Statistics intended to show the effect of occupation upon mortality are, as a rule, the most unsatisfactory of all statistics, in consequence of the many sources of possible error which affect them. Different methods have been employed for the purpose of ascertaining the effect of occupation on mortality; (1) The mean age at death, a method which is always open to objection in consequence of the fact that the mean age at death is governed largely by the mean age of the living, and may be affected both by the age at which people enter and leave any given occupation, and by the increase or decrease of employment. Instances also are on record in which all the older employes of a large establishment are discharged, to give place to young persons from 15 to 25 years of age. The mean age at death in such instances would be lowered. (2) The ratio of the number dying in any given occupation compared with the number employed in the same. This mode must be fallacious for the same reasons as the former. (3) The best method is to compare the mortality of those engaged in one occupation, and of a given age, with the mortality of those engaged in another occupation, and of a corresponding age. (Newsholme.)

The difficulty of obtaining these data with accuracy has proved a serious obstacle in arriving at conclusions upon this point in the United States. Another source of error in this country is the greater want of permanency or stability of employes. People in New England, for example, often change their occupations at different periods of life. Many men, after acquiring a competency, retire to small farms

and die as agriculturists, thus increasing the mean age at death of this class, and diminishing that of the class which they have left. In Europe, on the contrary, occupations are far more permanent, and are more often transmitted from father to son for many generations.

It is with pleasure that we turn to an honest attempt at certain inquiries in America relative to the effect of occupations upon the life of workmen. The Reports of the Bureau of Statistics of Labor of New Jersey, for the years 1889, 1890, and 1891, contain a valuable series of statistics upon this subject, the object in view being to ascertain the "duration of the active trade or working-life of workmen."

The value of this inquiry may be summed up in the words of the compiler. "This phase of the question heretofore has received little attention, but is one of immense moment to the wage-worker, who, if still alive, will sooner or later find himself unable to continue at work in competition with younger men. Perhaps of not more than 40 or 50 years of age, and still in comparative good health, with an expectation of life of from 20 to 25 years, he is, by reason of some slight physical impairment, unfitted to follow a trade in which he has spent the best of his early days to become efficient."

The Bureau decided to seek for information showing the age at which a workman began to work at his trade, his present age, the age at which he began to decline, that is, grow less active, or become incapacitated, and the total number of years actually at work, as a basis for a correct estimate of the duration of his trade life. The information was obtained by means of blank forms addressed personally to each workman, and placed in the hands of competent agents.

The entire number of workmen included in the statistics of the three years was nearly 13,000, and the occupations represented were the following: carpenters, painters, bricklayers and masons, stone-cutters, plumbers, printers, glass-blowers and glass-workers, hatters, miners, and workers in potteries. The glass-workers, hatters, and potters were classified into several sub-groups. The average *present age* (age at time of taking the statistics) of the workmen varied from 28.5, 29.3, 30.5, 30.5, and 31.2 years, respectively, in pot-handlers, pot-decorators, pot-packers, pot-pressers and printers, up to 42.2, 42.4, 42.6, and 42.7 years, respectively, in pot-throwers, window-glass flatteners, shearers, and glass-pot makers. The average *number of years at work* varied from 12.5, 12.7, 13.4, 14.1, and 14.2 years, respectively,

in pot-packers, glass-shearers, pot-decorators, window-glass blowers, and stopper-grinders; up to 19, 21.6, 21.8, and 29.3 years, respectively, in stone-cutters, pot-mould makers, pot-dippers, and pot-throwers. (The last figure has but little significance, since it is made up by three individuals only.)

The percentage of those beginning to decline was greatest in glass-pot makers, green-bottle makers, and flint-glass blowers (57.3, 35.4, and 29.4 per cent); and least in stone-cutters, glass-stopper grinders, pot-throwers, and pot-packers, where there were no representatives.

The highest per cent of American born workmen was among those of the glass-making groups (100 in each), and the lowest (16.5, 23, 34, and 34 per cent) among stone-cutters and three of the groups of potters. The largest groups of individuals contributing to the returns were carpenters, 2732; miners, 1269; hat finishers, 1257; hat-makers, 1247; painters, 1235; bricklayers and masons, 1022; stone-cutters, 701; and plumbers, 661.

The most common causes of decline reported among carpenters were rheumatism, loss of energy, general debility, accidents (falls from scaffolding and broken limbs), and failing eyesight; among painters painters' colic (greatly in excess of all other causes), loss of energy, rheumatism, constipation, lead-poisoning, and accidents; among bricklayers and masons, rheumatism, stiffness of joints, loss of energy, and accidents; among plumbers, malaria, rheumatism, typhoid fever, lung disease, and lead and blood poisoning; among printers, failure of eyesight, lung disease, general debility, and nervousness.

The Report states that "these data are fairly representative of the whole, embracing a very considerable proportion of the workmen in the respective occupations living within the territory covered, and accessible at the time of the enumeration. As a rule, this had to be done by a house-to-house canvass during the early hours of the evening, for not only do employers not take kindly to the interruption of their workmen, but most of those engaged in the pursuits mentioned, those of the building trades, work in isolated gangs, and are not to be reached even during the work hours."

The Bureau is to be congratulated upon the success of this comparatively unique inquiry, and we trust that it will be continued in the future.

S. W. ABBOTT.

INFLUENCE OF OCCUPATIONS UPON MORTALITY.

Journal de la Société de Statistique de Paris. October and November, 1892.

The general effect of vocation upon health has been studied scientifically but twice in France; the first time by Gustave Hubbard, in 1852, and the second recently by Dr. Bertillon, the chief of the statistical bureau of Paris, who has tabulated the returns of several mutual aid societies among the Lyons silk operatives. The special importance of this paper, *De la morbidité et de la mortalité par profession*, by Dr. Jacques Bertillon, attaches to the mortality statistics, the definition of sickness by the various aid societies which furnished the figures of morbidity being too various and conflicting to serve as a basis for generalization; nevertheless, a few conclusions as to relative morbidity, which the author draws, are interesting. It appears that women from 20 to 25 years of age, in the Austrian societies, lose considerably more time from sickness than the men of the same age, but after 45 years the losses are more nearly equal. Among the silk workers of Lyons both the morbidity and mortality of women exceed that of men, although this is not in general true of the whole population; and the Italian societies furnish results which bear out the same conclusions. Yet the general mortality of the women, without regard to age, is less than that of the men, although the mortality at each age is greater. This apparent contradiction is due to the fact that 42 per cent of the women are under 40 years of age, while but 20 per cent of the men are below this age. Among the Lyons operatives (1872-89) the average number of days lost from illness annually among the women was 9.390; among men, 7.810; but the average mortality among the men was 23.4 per 1000, while that of the women was only 17.6. In various Italian societies, whose records are compared in this way, the women lost 8.5 days in the year from illness, while the men were incapacitated but 6.6 days; but here, as before, the mortality for men was higher, being 11.7 pro mille, as against 10.7 for the women.

The general results of the investigations, as to the effect of age upon the mortality rates, are contained in the following table: —

Ages.	English Tables.				French Tables.		Italian Table.
	Friendly Society. (Masc.) Finlaison.	Manchester Unity of Odd Fellows. (Masc.) Henry Ratcliffe.			Mutual Society. Hubbard.	Silk Workers of Lyons. (Masc.) Bertillon.	Mutual Society. (Masc.) Bodie.
	1846-50.	1846-48.	1856-60.	1866-70.	1835-49.	1872-89.	1881-85.
20-25	7.48	7.40	7.58	6.43	8.5	13.0	6.3
25-30	7.29	7.90	7.48	7.62	7.5	5.4	5.9
30-35	7.96	8.70	8.34	8.18	9.5	6.4	6.2
35-40	8.93	9.16	9.91	9.77	8.2	6.4	7.8
40-45	11.00	11.65	11.78	12.58	8.9	10.2	9.2
45-50	13.06	13.99	14.21	14.29	15.5	11.8	11.6
50-55	16.36	18.61	17.95	19.05	16.3	20.2	14.9
55-60	23.60	28.67	26.09	24.92	20.3	19.5	22.2
60-65	28.55	41.14	36.66	35.37	29.9	40.7	32.5
65-70	43.91	57.21	54.99	52.09	54.3	67.0	50.4
70-75	62.03	70.42	68.25	78.11	134.3	88.0	73.6
All Ages	12.57	9.75	11.89	12.63	14.2	23.5	11.7

There is also a valuable series of diagrams, showing graphically the mortality, by occupations and ages, in Paris, England, and Switzerland, which illustrate the general conclusions which the author draws in the succeeding portions of the paper.

The occupations grouped according to general healthfulness, beginning with those which are least favorable to longevity, are: (1) professions involving exposure to the inclemencies of the weather without physical activity, as coachmen, cab-drivers, and carters; (2) professions exposing the individual to dust in the open air, including stone cutters, quarrymen, etc.; masons, slaters, and the like, have a death rate but slightly lower than these; (3) occupations with exposure to hard or metallic dusts in a confined space have as high an average mortality as the preceding class, no matter what the nature of the dust may be, as needle-makers, cutlers, file-grinders, potters, brush makers, etc.; (4) vocations exposing the artisan to soft or organic dusts, including millers, bakers, chimney-sweepers, etc.; (5) occupations carried on in heated, smoky, or vaporous atmospheres. Blacksmiths are a healthy class in Paris, though less so in England, and least so in Switzerland. Mechanics have an average rate of mortality; bakers a little higher, owing to the dusts; while glass-cutters are

seriously affected by the powder which is inhaled. Next in order come (6) occupations involving possible poisoning, as artists, potters, painters, plumbers, employes in chemical works, especially where mercury is present; tobacconists are included here, as well as those who are liable to contact with tainted or decaying substances, as tanners and butchers. The mortality in this group is generally considerable. (7) Groups of occupations with temptations to indulge in intoxicants, as wine merchants and hotel keepers. English brewers as a class have a lower death rate. (8) The class exposed to accidents of various kinds, as fishermen, quarrymen, and the like, whose mortality rate is also increased to considerations of other sorts, as in class (2). (9) Sedentary occupations cause a high rate of mortality, especially if they be carried on in impure air. A process of natural selection seems also to be at work here, as this class is generally recruited from the less vigorous portions of the population. The rate here is less than that of fruiterers and grocers, while fish dealers and haberdashers have an average mortality. Tailors have a high death rate, somewhat above that of engravers, watchmakers, and cobblers. The tenth class includes the so-called professions where the vitality is high, largely owing to the leisure which generally accompanies such a life. Priests, judges, and public functionaries have the lowest death rate of all in this group; and lawyers, architects, and engineers have a mortality below the average for the class. Physicians have a rate even lower than lawyers, especially in Paris. (10) Most conducive to longevity are those occupations which, like the first class, necessitate exposure to the weather, but which, unlike it, require considerable bodily activity, as market gardeners, florists, and watermen.

On the whole, then, these results bear out the conclusions arrived at by Professor Westergaard, in his studies of the English population. The more recent investigations of Dr. Ogle, which will soon be published, are also confirmed. To be sure, in these studies, the clergy is marked as the most healthy class of the population, their death rate being but 66 per cent of the average for 62 chosen occupations, according to Westergaard. And in Dr. Ogle's tables the mortality for the next higher class, the gardeners, is 8 per cent greater. Yet the clergy is a picked class in England, which has no counterpart in France. The conditions there are so widely different as to vitiate any

comparisons. In regard to the healthiest occupation cited by Dr. Bertillon, a curious result appears, that, while the position of small farmers is so enviable in England and Switzerland, the same class in Italy loses more days from sickness annually than the industrial population. This result is confirmed in the two distinct periods considered. In Switzerland, as in England, consumption is the most prevalent disease, and the rate of mortality due to it, among farmers, is twice as high as the average for the whole population.

This valuable paper concludes with eleven extended tables, which have been computed for the mortality by vocations in Paris, England and Wales, Switzerland, and the Italian and Austrian mutual aid societies. They indicate clearly the average number of days lost from sickness yearly, together with the cause of death when it occurs. The tables themselves should be very valuable to the actuary; but they are also of general interest to the statistician, and form a basis from which the further investigation of the subject can be readily continued.

WILLIAM Z. RIPLEY.

FERTILITY OF MARRIAGES IN PRUSSIA ACCORDING TO THE RELIGIOUS CREEDS OF THE CONTRACTING PARTIES.

The *Zeitschrift des Königlich Preussischen Statistischen Bureau*s for 1891 contains a very interesting article upon the fertility of marriages in the different religious sects of Prussia for sixteen years (*Eheliche Fruchtbarkeit bei den verschiedenen Religionsgemeinschaften in Preussen, 1875 bis 1890*).

Since 1875 the Royal Statistical Bureau has kept a valuable record of marriages and births, together with the religious beliefs of the contracting parties, as well as their social positions. The figures are vouched for, and the records of the Bureau thus furnish a basis for reckoning the average fertility of all marriages according to creeds, callings, and social groupings.

The following table is a summary of all the tables which are given in the above article. The Evangelical creed is the established religion of Prussia. The group "other Christian" includes all Christian creeds except the Evangelical and the Catholic.

MARRIAGES AND LEGITIMATE BIRTHS IN PRUSSIA, ACCORDING TO RELIGIOUS CREEDS.
1875-1890, 16 Years.

Creed of Father.	A. Mother, Evangelical.					B. Mother, Catholic.				
	1.	2.	3.	4.	5.	1.	2.	3.	4.	5.
	Total Number of Marriages.	Total Number of Births.	Average Number of Births per Marriage.	Number of Still-Births.	Still-Births per 100 Births.	Total Number of Marriages.	Total Number of Births.	Average Number of Births per Marriage.	Number of Still-Births.	Still-Births per 100 Births.
Evangelical...	2,214,303	9,631,416	4.35	389,639	4.05	118,772	391,538	3.30	12,947	3.31
Catholic.....	139,342	465,734	3.34	15,752	3.38	1,046,903	5,484,658	5.24	196,085	3.56
Other Christian	2,481	6,640	2.68	210	3.16	294	912	3.10	33	3.62
Jewish.....	1,763	2,794	1.58	93	3.33	308	426	1.38	11	2.58

Creed of Father.	C. Mother, Other Christian.					D. Mother, Jewish.				
	1.	2.	3.	4.	5.	1.	2.	3.	4.	5.
	Total Number of Marriages.	Total Number of Births.	Average Number of Births per Marriage.	Number of Still-Births.	Still-Births per 100 Births.	Total Number of Marriages.	Total Number of Births.	Average Number of Births per Marriage.	Number of Still-Births.	Still-Births per 100 Births.
Evangelical....	1,814	2,966	1.63	84	2.94	1,578	2,809	1.78	96	3.42
Catholic.....	253	555	2.19	25	4.50	458	761	1.66	31	4.07
Other Christian	4,074	29,408	7.22	970	3.30	77	496	6.44	33	6.65
Jewish.....	30	242	8.07	9	3.72	38,264	160,935	4.21	5,288	3.29

Men naturally seek wives of the same creed. But this rule is by no means general, and there are many exceptions, especially among those men holding creeds which include but a small portion of the population of the state or district in which they live. From the tables in the above article we have the following, based upon the records of the 16 years :—

Of the 2,336,467 Evangelical men, 94.77 per cent married Evangelical women.
 “ “ 1,186,966 Catholic “ 88.20 “ “ Catholic “
 “ “ 6,926 other Christian men, 58.82 “ “ other Christian women.
 “ “ 40,365 Jewish “ 94.79 “ “ Jewish “

Since the Jewish population is only 1.25 per cent of the entire population, these figures show that Jews in their choice of wives are more consistent than any other religious sect,—a further proof of the firm bonds of the Jewish race.

The following figures show to what extent the Jews and Christians intermarry :—

Of the Jewish men,	5.21 per cent	marry	Christian women.
“ “ Evangelical men,	only 0.07 “ “ “	“	Jewish “
“ “ Catholic men,	only 0.04 “ “ “	“	“ “
“ “ “Other Christian” men, only	1.11 “ “ “	“	“ “
“ “ Jewish women,	5.23 “ “ “	“	Christian men.
“ “ Evangelical women,	0.07 “ “ “	“	Jewish “
“ “ Catholic women,	0.03 “ “ “	“	“ “
“ “ “Other Christian” women,	0.49 “ “ “	“	“ “

The relatively high number of marriages between “Other Christians” and Jewish persons, as well as the extraordinary low percentage of marriages between themselves, may be explained by the several miscellaneous creeds which are grouped together as “Other Christian.” It includes, for example, on the one hand, the Apostolic church (Irvingites), Baptists, Mennonites, Anglicans, Presbyterians, Methodists, and Quakers; and, on the other hand, Dissenters, Free Religious Creeds, and Mormons. In the first group men and women would be as apt to marry members of their own creed as are the Evangelists, but the creeds in the second group are characterized by no strict matrimonial laws, hence marriages with persons of other creeds are more frequent. Again, many of these other Christians are Christian Jews who would not hesitate to marry members of their own race. This fact may explain the relatively large number of marriages between “Other Christians” and Jews, and also it may explain the relatively high rate of fertility accompanying such marriages.

Now while the fertility of marriages between people of the same creed is relatively high, we have, on the other hand, a low percentage of births where the parents are of different creeds. For example, we see from the above table that the average number of births per marriage in which both parties have the same creed varies from 5.24 to 3.30 for unions between Catholics and Evangelists. But in cases of unions where there are—

Evangelical men and Jewish women, there are only 1.78 births per marriage.					
Catholic men and Jewish women, “ “ “	1.66	“	“	“	“
Jewish men and Evangelical women, “ “ “	1.58	“	“	“	“
Jewish men and Catholic women, “ “ “	1.38	“	“	“	“

It thus appears that it makes but little difference in fertility whether the man or woman in a mixed union belongs to the Jewish race. The number of children per average marriage varies from 1.78 to 1.38, and a population of Christian-Jewish couples would soon die out.

But in the case of unions between Jews and "Other Christians" the fertility is very marked. Thus, with men belonging to "Other Christian" creeds, the fertility of marriages with Jewish wives is 6.44 births per union, and with Jewish men in union with "Other Christian" wives this average is 8.07 children.

The article also compares the different religious creeds according to still-births, as shown in columns 4 and 5 of the table. From this table we see that the number of still-births is greatest in cases where both parents are Evangelical (4.05 per cent). The other creeds are then arranged in order, as follows:—

1. Both parents Evangelical,	percentage of still-births, 4.05
2. Both parents Catholic,	" " " 3.56
3. Catholic father, Evangelic mother, . . .	" " " 3.38
4. Evangelic father, Catholic mother, . . .	" " " 3.31
5. Both parents "Other Christian,"	" " " 3.30
6. Both parents Jewish,	" " " 3.29
7. "Other Christian" father, Evangelic mother,	" " " 3.16

The variations here may be due in some cases to the lack of registration of premature births, etc. among the poorer classes, as, for example, in the eastern provinces, where the Catholics are chiefly of Polish descent. This may also explain the variation in 3 and 4 above.

The article reviewed above lacks two important considerations, which seem to me quite necessary before we can judge of the relative marriage fertility of different creeds. These are the social status and the nationality of the parties concerned. A man's creed depends largely upon his intellectual status in society, and the fertility of marriage unions upon the degree of intelligence of the contracting parties, hence comparisons of creeds relative to marriage fertility should be made only between equal grades of society. Then, again, different races vary greatly in fecundity, and the nationality of the contracting parties, as well as in their religious beliefs, should be considered.

A further criticism might be made upon the manner in which averages derived from great numbers of cases are compared with averages derived from few cases. Compare, for example, in Table I, section C, column 1, with section A, column 1. Here the average derived from thirty cases is compared with that derived from more than two millions of cases.

GARY N. CALKINS.

THE FRENCH POPULATION.

Journal de la Société de Statistique de Paris. September, 1892. *La population française.* Par M. Levasseur.

The population of France is nearly stationary, yet almost every census since 1800 has shown an absolute increase in the number of people. The only exceptions to this rule have been the year 1853-54, when both war and the cholera united to check the natural growth; 1870, again, was a time of war, and in 1890 (probably also in 1892) there was a negative result shown by the enumeration. The naturally slow growth has been accentuated during the last fifteen years, so that today all of the problems presented by a stationary population are especially pressing and urgent. One of the most important of these is that of the relative increase of wealth and population, and in this regard France is especially fortunate, comparing favorably with the rest of Europe. The political problem now is concerned rather with the absolute increase in numbers. France possessed 21 per cent of the population of the five great European powers in 1816, while in 1890 she constituted only 13 per cent of the aggregate population of the six most important nations. This the author considers the burning question of the time for all patriotic Frenchmen, as in the present armed state of Europe it may affect the autonomy or independence of the nation.

From 1801 to 1810 the rate of mortality was 28.2 per 1000; from 1881-88 it fell to 22.2; whereas, the average for Europe is now 28, and of twenty-nine states there are but nine which have a lower rate than France. In reality the improvement in general vitality is not as great as the figures indicate, for it is the birth rate which has decreased the most, which in itself means a larger proportion of adults, and consequently a lower death rate, irrespective of all other considerations. Nevertheless, there has been considerable improvement due to greater civilization, spite of this necessary correction. The marriage rate from 1881 to 1888, 7.4 per 1000, is somewhat below the average for Europe (8.4 per 1000 from 1865 to 1883). It has fallen since 1880, partially as a result of the great mortality in the wars of 1870, among men who would still be within the ages of probable marriage,

especially among the thrifty peasantry. Yet, since the same results are observed in other states not depopulated by war, it is more likely due to longer army service for men of a marriageable age.

The great weakness of France is the low birth rate. This has fallen during this century from 32.2 per 1000, in 1801-10, to 24 in 1881-88, although the decrease has been less rapid since 1850. With a rate of 25 per 1000 in 1865-83, France stood last among European nations, the average of which was 38.5. Its marriage rate was more normal, as France stood 18th in a total of 29 nations. Since 1886 the number of births has fallen below 900,000, and, owing to the epidemic of influenza in 1890, was even less than the number of deaths. This feeble birth rate is largely responsible for the low death rate, of course, and it is merely an exaggeration of a phenomena common to all the states of Europe. Since 1872 its population, considering the excess of births over deaths, has gained on the average but 3.4 per 1000 yearly, while that of Europe has grown at the rate of 11 per 1000, and the German Empire at a rate of 11.6 per 1000. The annual surplus for the last ten years has not been above 2.9 per 1000 as in 1881, and the average has been but 1.7, so that the least disturbance of normal conditions may change it into a deficit, as in 1890. Illegitimacy is not very great, being but 7.5 per 1000 births, though it has risen in single years to 8. This is rather from a decrease in legitimate births, however, than from increase in the absolute number of illegitimate ones.

The low birth rate and the rapid increase of wealth offer great inducements to immigration; and the population of France includes a larger proportion of foreigners than any other great European power. The same reasons conspire to prevent excessive emigration, the number being only 20,000 to 30,000 a year. Within the nation there is a great immigration of the rural population into the cities. This movement is really less marked than in the United States, but the general increase of population there is so slow that it does not counterbalance the decrease in the country districts. As a result, 41 departments had a smaller population in 1886 than in 1846, and the last two censuses (1886 and 1891) show a positive decrease in 51 departments against an increase in but 32. This is brought out in a succeeding article by M. Leon Roquet.

The distinguished author is of the opinion that it is useless to look

for any change in these various tendencies at present; they are, indeed, more likely to become accentuated. The hope of France for the future is in hygienic regulations, morality, and education, which will tend to reduce the rate of mortality, that thereby the present deficit may become converted into a surplus.

Journal des Economistes. October, 1892. *La population française le dénombrement.* M. Leon Roquet.

This sketch deals with a tendency toward the concentration of population in large cities, which we have noted above in the statistics of M. Levasseur, but it brings the figures down to a later date, including the results of the census of 1891. In France there are 56 cities having over 30,000 inhabitants, among which 9 show an absolute decline in population since the last census. Nantes, Saint Nazaire, Calais, and Boulogne are among this number; Dunkirk shows a considerable falling off due to the tariff legislation. The 47 other cities show a total increase of 372,074 inhabitants, which is not due to excess of births over deaths, but to immigration from the rural communes. Indeed, the total increase of population shown by the last two censuses has been but 124,289. Paris alone has gained 103,407, which is more than the total population of some of the departments. The suburbs of Paris have absorbed many of the emigrants from the country; the department of the Seine, for instance, shows in four years and a half an increase of 180,000, a rate of increase exceeding 3000 per month.

The other principal cities have increased by the following amounts: Lyons, 36,147; Marseilles, 27,606; Bordeaux, 11,833; Montpellier, 12,493; Saint Etienne, 15,588; Nice, 10,795; Roubaux, 14,618; Lille, 12,939. The result of these various concentrations of population, exclusive of Paris, is that these lesser cities have drawn to themselves more than twice the total increase of the population of France since the last census. The great cities not only absorb the entire increase of population, but three or four times that number, so that the rural communes are being actually depopulated, as M. Levasseur has demonstrated in his great study of the subject.

W. Z. RIPLEY.

THE GEOGRAPHICAL DISTRIBUTION OF SEXES.

Karl Bücher has recently published in the *Allgemeines Statistische Archiv*, for 1891-92, Part II, a paper entitled *Ueber die Verteilung der beiden Geschlechter auf der Erde*, originally read before the *Verein für Geographie und Statistik zu Frankfurt a Main*.

This paper is of more or less popular value, and the conclusions are based almost entirely upon statistical facts derived from provinces in Germany rather than from the entire world. Bücher's main thesis is to show that sexes are not evenly distributed throughout the globe, and that there is in all places a tendency towards preponderance of one sex.

It is impossible to ascertain at present the exact proportion of men to women upon the earth's surface, because of the inexact returns, when there are any, from uncivilized countries. Still, whatever may be the inequality between members of both sexes in the world at large, we find upon limiting ourselves to certain portions of it, in which statistics are accurate, that there is a decided inequality.

Of the five great divisions of the earth Europe alone has a preponderance of females. In America, Asia, Africa, and Australia males are more or less in excess. The subdivisions of each of these continents show the same inequalities. Thus in Europe we find a preponderance of males in seven of twenty-eight states, and an excess of females in the remainder. In America, too, there is a difference between the west and the east of Canada and the United States. In these countries the west invariably has a preponderance of males, but the inequality becomes less and less in approaching the middle regions; and in the east women are in excess.

The table shows great variations in the proportion of men to women in different parts of the world. Up to the present time the excess of females has been considered as due to emigration or unnatural causes, but Bücher thinks that these causes do not fully account for the differences, and believes that there must be some deeper reason, although he does not tell us what it is.

Confining himself to portions of Europe where statistics are complete and reliable he gives many illustrations, showing that equality is never reached. In France, for example, a country which has been frequently taken to illustrate a tendency towards equal numbers of both sexes, he shows that the equality is only apparent. Here unnatural

causes furnish more men than women, and the natural inequality is thus balanced. The true result should be based on the relation of births and deaths, and this in France for the six years 1881-86 is as follows:—

	<i>Male.</i>	<i>Female.</i>	<i>Females to 100 Males.</i>
Births,	2,857,001	2,726,467	954
Deaths,	2,629,963	2,434,448	925
Excess,	227,038	292,019	1,286

In the cities of Germany we find a preponderance of women, but the standing armies so affect the registration that it is difficult to ascertain the true proportion of males to females at any particular place. Leaving the floating population out of consideration, and counting only those who were born and reared at the same place, we find in German cities 104 boys born for every 100 girls. These girls, however, have a better chance for longevity than do the boys, and to such an extent that between the ages of 20 and 30 years the numbers of the two sexes are about equal.

The preponderance of females over males in some of the European cities is shown by the following table:—

	<i>Females to 1000 Males.</i>		<i>Females to 1000 Males.</i>
Stockholm,	1,176	Antwerp,	1,057
Gothenburg,	1,176	Liege,	1,096
Hague,	1,204	Geneva,	1,191
Rotterdam,	1,202	Berne,	1,182
Amsterdam,	1,186	Copenhagen,	1,172
Bruges,	1,291	Paris,	1,050
Ghent,	1,146	Vienna,	1,124
Brussels,	1,144	Prague,	1,171

Bücher argues that, if this greater loss of boys were caused by emigration, accidents, and similar agents of removal, we must look for like causes in those countries where males predominate, as Italy, for example. This he considers improbable, and concludes from it that the tendency is towards inequality of distribution of the sexes.

Bücher's conclusions, however, do not prove much either way, and his illustrations should have included cities and countries more widely separated. If emigration and surroundings are not of much consequence in determining the proportion of men to women, newly settled lands should show no variation in this proportion from time to time, and, for the same people, no variation from that of the native countries. On the other hand, it is a well-known biological fact that environment has much to do with the question of sex.

The following table shows the relation between the sexes in various parts of the world:—

TABLE SHOWING THE GEOGRAPHICAL DISTRIBUTION OF SEXES. (Abridged.)

I. COUNTRIES OF EUROPE.	Year.	Date.	Male Population.	Female Population.	Females to 1000 Males.
Russia.....	1886	.....	42,499,324	42,895,885	1,009
Germany.....	1890	Dec. 1..	24,231,832	25,189,232	1,039
France.....	1886	May 30.	18,900,312	19,030,447	1,007
Great Britain and Ireland.....	1891	Apr. 5..	18,388,756	19,499,397	1,060
Italy.....	1881	Dec. 31.	14,265,383	14,194,245	995
Austria.....	1880	"	10,819,737	11,324,507	1,047
Spain (with Canary Islands).....	1887	"	8,608,532	8,950,776	1,039
Hungary.....	1880	"	7,799,276	7,939,192	1,019
Poland.....	1886	.....	3,977,406	4,279,156	1,076
Belgium.....	1890	Dec. 31.	3,062,666	3,084,385	1,007
Sweden.....	1890	"	2,317,105	2,467,570	1,065
Portugal.....	1878	Jan. 1..	2,175,829	2,374,870	1,091
Roumania.....	1860	.....	2,276,558	2,148,403	944
Netherlands.....	1889	Dec. 31.	2,228,487	2,282,928	1,024
Bulgaria.....	1881	.....	1,519,953	1,462,996	962
Switzerland.....	1888	Dec. 1..	1,427,377	1,506,680	1,055
Finland.....	1889	Dec.....	1,152,111	1,186,293	1,030
Greece.....	1889	.....	1,133,625	1,053,583	929
Denmark.....	1890	Feb. 1..	1,059,222	1,112,983	1,051
Servia.....	1890	Dec. 31.	1,110,731	1,052,028	947
Norway.....	1891	Jan. 1..	951,496	1,037,501	1,090
Bosnia and Herzegovina.....	1885	May 1..	705,025	631,066	895
Total for all of Europe.....	....	.....	170,818,561	174,914,119	1,024
II. AMERICAN COUNTRIES.					
United States.....	1880	June 1..	25,518,820	24,636,963	965
South America.....	....	.....	6,581,284	6,241,733	949
Mexico.....	1882	.....	5,072,054	5,375,920	1,060
British North America.....	1881	.....	2,288,196	2,229,735	974
Cent. America and West Indies.....	....	.....	2,170,430	2,042,535	941
Bermuda Islands.....	1890	.....	7,767	8,117	1,046
Greenland.....	1888	Dec.....	4,838	5,383	1,112
Total for America.....	....	.....	41,643,389	40,540,386	973
III. COUNTRIES OF ASIA.					
British India.....	1891	.....	112,150,120	108,313,980	966
Tributary States.....	1891	.....	31,725,910	29,675,150	935
Japan.....	1888	.....	20,008,445	19,598,789	979
Russian Possessions.....	1885	.....	7,914,431	7,112,178	890
Total for Asia.....	....	.....	177,648,044	170,269,179	958
IV. COUNTRIES OF AFRICA.					
Egypt.....	1882	May....	3,401,498	3,415,767	1,004
Algeria.....	1886	.....	2,014,013	1,791,671	889
Total for Africa.....	....	.....	6,994,064	6,771,360	968
V. AUSTRALIA.					
.....	....	.....	2,197,799	1,871,821	852

GARY N. CALKINS.

EFFECT OF PARENTS' AGE ON VITALITY OF CHILDREN.

Josef Körösi has recently written an interesting article upon the *Effect of Parents' Age on the Vitality of Children* in the *Jahrbücher für Nationalökonomie und Statistik*, No. 4, 1892. It is based upon records kept by himself during the five years between 1878 and 1882, and during the years 1888 and 1889, making in all seven years, although not consecutive.

Körösi divides the causes of death among children under 10 years of age into two groups,—those caused during pregnancy, or uterine, and those which develop after the birth of the child, or extra-uterine. The same diseases were not studied during both periods, but in both periods constitutional delicacy, water on the brain, rachitis, and scrofula were recorded, whereas lung tuberculosis, inanition and atrophy, and premature still birth were recorded for the two-year period only.

His results show that the uterine diseases depend much more upon the age of the mother than the other class, and the article makes a strong argument against early marriages of women, but the age of the father does not seem to make much difference upon the vitality of the child. The strongest children, however, are those whose fathers are between 30 and 40 years of age, while the mortality of those born before the father has reached the age of 25 seems to correspond with that of the children whose mothers are under 20. These facts are shown by the following tables:—

EFFECT OF THE MOTHER'S AGE.

Age of Mother.	Uterine Diseases.		Intestinal Catarrh.
	Two-Year Period. (Including Tuberculosis.)	7 Years. (Excluding Tuberculosis.)	7 Years.
	<i>Deaths.</i>	<i>Deaths.</i>	<i>Cases.</i>
Under 20 years.....	37.32 per cent.	22.31 per cent.	26.29 per cent.
From 20 to 30 years.....	21.09 "	14.31 "	21.89 "
From 30 to 35 years.....	14.04 "	12.86 "	18.05 "
Above 35 years.....	15.35 "	13.45 "	19.25 "
Age of Father.			
Under 25 years.....	20.41 per cent.	14.57 per cent.	19.31 per cent.
From 25 to 30 years.....	18.17 "	14.13 "	22.02 "
From 30 to 40 years.....	17.05 "	12.92 "	20.03 "
From 40 to 50 years.....	21.46 "	16.02 "	21.10 "
Above 50 years.....	10.14 "	11.96 "	18.44 "

From the above table, if we take the mothers' ages from 20 to 30 as 100, we have —

	For 2 Years.		For 7 Years.		
Below 20 years,	Uterine diseases,	176	156	Intestinal catarrh,	120
From 20 to 30 years,	" "	100	100	" "	100
" 30 to 35 "	" "	66	90	" "	82
Above 35 years	" "	73	94	" "	88

Körösi also finds that it makes but little difference in regard to the vitality of the child whether the father or mother is the older, provided that the difference in ages is not too great. A difference of 10 years seems to be the limit within which the strongest children are produced.

G. N. C.

THE FALL OF THE RATE OF INTEREST AND ITS INFLUENCE ON PROVIDENT INSTITUTIONS.

In *La Reforme Sociale* (Nos. 45 and 46) for November, 1892, appears an article on the above subject by M. Cheysson, with an appended discussion by MM. Juglar, Fougereousse, Gibon, and Cheysson.

M. Cheysson declares that the present decline of the rate of interest contains elements for social and financial revolution. It especially affects provident institutions, societies for mutual insurance, etc. He first enumerates the general causes and notes their effects: The increasing amount of capital, its mobilization and entrance into the market, the competition for investments which become less and less remunerative, lead, on the one side, to a constant reduction in the rate of interest, and, on the other, to wild speculative adventure. In consequence of the fall we observe, *e.g.*, that the *3 per cent perpetuel français*, which represent a capital of 12 milliards, have risen from 70.05 f. in 1869 to 100.45 f. in 1892 (June 15). Other values have had the same history. The recent conversions of debt are also significant. In 1888 the English debt was refunded at an interest of $2\frac{3}{4}$ per cent, which in 1913 will be reduced to $2\frac{1}{2}$ per cent. When the great loans, national, municipal, and industrial, shall have been paid, as appears probable in the next half century, "what enterprises can be imagined to absorb the surplus?" This question M. Cheysson leaves to posterity, to whom we leave "*en même temps que nos bienfaits l'embaras des richesses.*" But for present concern it should be ob-

served that this prospective fund will maintain the present low rate of interest if it does not, indeed, cause a greater decline. The low rate of interest makes new enterprises possible. It diverts capital to agriculture where scientific production is at last made possible. The general result is the improvement of the position of manual labor. The demand is increased, the supply remains stationary, while in addition the products of manufacture are made cheaper. The cost of lodging is above all diminished. A house worth 6000 f. renting for 300 f. at 5 per cent becomes 180 f. at 3 per cent, and the purchase annuity declines from 481 f. to 403 f. On the other hand, the fall of interest deprives the idle of a large part of their income,—they must work or retrench. It is like a phenomenon of depreciation. It is a loss to capitalists, fundholders, and creditors, and a profit to laborers and debtors. It is, M. Cheysson declares, a “democratic phenomenon.”

He notes next the special effects of the fall of interest on the accumulation of savings and provisions for old age (*retraites*). These are results which disadvantageously affect those classes which we have just seen to be favored in general. In respect to the first it is assumed as true that a diminution of savings will follow a fall in interest. In regard to pensions it has been found that they are importantly affected. Pensions are calculated on two factors,—the mortality table and the rate of interest. The insurance companies of France have been compelled to revise both. They have adopted new mortality tables, and have reduced the rate of interest from 4 per cent to $3\frac{1}{2}$ per cent, not daring to approach closer the normal rate. Some of the mutuals have proceeded at hazard, without any scientific bases. This has been the history also of the civil pension fund (*caisse des pensions civiles*), in which the deficit has risen at present to 40 millions. Similar difficulties have been met in the pensions of the railway service. But the greatest difficulties have been encountered in the cases of individuals and of mutual companies. With a payment of 50 f. for 30 years (until 55) the laborer obtained a pension of 410 f. at a rate of 5 per cent, but with a rate of $3\frac{1}{2}$ per cent this would be reduced to 270 f., or over a third. Again, to obtain a pension of a franc a day, it would require a contribution for the same period of 41 f. annually at 5 per cent, but of 66.70 f. at $3\frac{1}{2}$ per cent. It is this which leads the laborer to live from day to day, and to demand that the state shall make a provision for old age which is beyond “the individual efforts of the laborer.”

The *sociétés de secours mutuels* are very much dissatisfied with the present rate of $3\frac{1}{2}$ per cent. By the law of 1850 the rate of the *caisse de la vieillesse* was placed at 5 per cent. It was reduced to $4\frac{1}{2}$ per cent in 1853, and in 1872 raised again to 5 per cent, to be reduced again in 1882 to $4\frac{1}{2}$ per cent. These rates threw too heavy a burden on the fund which realized no such interest. A large deficit was created. The policy of the directors was to limit as much as possible their unprofitable *clientèle*. This led to a reform in 1886, by which the President fixed the rate for the year ensuing by the average rate of the investments of the year preceding. An immediate reduction to 4 per cent was made, and, finally, for 1892 to $3\frac{1}{2}$ per cent. The history of the unengaged funds (*fonds libres*) and pension funds (*fonds de retraite*) of the mutuals has been similar, being fixed by the *caisse des dépôts et consignations* at $4\frac{1}{2}$ per cent in 1856. But these were assimilated to the *caisse national de la vieillesse* in 1892. The societies were greatly disturbed, and claimed that the preservation of the former rates of interest was a part of the contract with the state, for which they exchanged the restraints of recognition and approbation. Moreover, they had not been financially at liberty to take advantage of the previous high rates which were granted, but had to wait and make their payments for each pension in a lump sum calculated at the then existing rate. Those payments made before the reduction held the earlier high rates during the life of the pensioner. Moreover, they asserted that as the state guaranteed a minimum dividend to the shareholders of the railways without reduction, they, numbering 1,200,000 mutualists, giving an example of thrift and largely aiding to prevent pauperism, were equally entitled to such consideration. The moderates asked that a double annual subvention be allotted to the pension fund; the extremists demanded a fixed rate of 5 per cent for the smaller pensions.

The rates of interest have been through a process of evolution in the Chambers. In 1889 they decided not to pledge a definite rate of interest which involved an indefinite demand on the income of the state, but rather to assist the funds by specific appropriations. Thus, the determination has been to give outright to the clients of the state only the revenues which the funds actually obtain, and thus negative the idea that the state can arbitrarily create the rate of interest. The great danger lies in the fact that an abnormal rate will attract to these funds commercial investments, and not the savings of labor. This

has been the experience of the *caisse de la vieillesse* when the payments have varied with the excess of the interest fixed over the market rate; and this is also true of the *caisse des dépôts et consignations*. The defenders of the privilege declare, however, that they would limit it to the members of the mutual societies, which they claim would prevent any abuse. But this seems first an unjust discrimination against private individuals, and, secondly, it would be no security because it is easy to become a mutualist, and everybody could take advantage of it. The system of granting an interest not acquired is false political economy and leads to false ideas, besides being financially risky. The argument of the mutualists, that the shareholders of the railways have a guaranteed interest is not decisive. They are temporary, and are based on a commercial contract. The pensions are based on payments made under varying economic conditions at a fixed rate. A more serious cause of complaint is the state interference in the financial control of the societies, which prevents them from taking advantage of the periods of high rates of interest, since payments have to be made in a capitalized form at specific times. But the weakness of this complaint lies in the fact that they get, as it is, a high rate of interest. Besides this the pensions are based on payments made by honorary and non-participating members, the payments of the participating members being insufficient to cover the general expenses.

The state assistance for the pensions of the mutual societies began in 1852, at the time of their origin, with a fund of 10 millions, giving a revenue of 510,000 f. This soon became insufficient, and the income of the fund was increased by successive annual appropriations until the total in 1891 was 960,000 f. This subvention is distributed among the "approved" societies according to the payments to the pension fund, the number of participants and the number of the latter over 55 years of age. This gives those societies having a large honorary list a great advantage. It also causes the societies, in their eagerness to get a large portion, to economize unduly. As the capital value of the pension payments is inalienable, and returns to the societies a large amount of property in mortmain is formed. M. Cheysson, in view of the existing deficit and the importance, socially, of encouraging and preserving the societies, advocates a special annual appropriation by the state. It should be applied first to increasing the income of those pensions which have been established since the

lowering of the rate of interest,—since 1892,—and to those of an “alimentary” character, *e.g.*, those of 360 f. and under. The general effect of the fall of interest, M. Cheysson repeats, is to the advantage of the laborer, especially as respects the habitation and the family. The rise of wages and the fall of prices both improve his condition, and give him a better opportunity to save. Credit, moreover, is easily obtainable, and becomes possible to the agriculturist. But the great advantage is as respects the housing. It becomes possible with money at $2\frac{1}{2}$ to 3 per cent to rent and purchase a house in fifteen to twenty years, where formerly rent alone could be paid. This means the consolidation of the family, which has been said to be the most secure insurance for old age.

FRANCIS WALKER.

LIMITATIONS OF STATISTICS.

In the March issue (1892) of the *Rassegna di scienze sociali e politiche* the scope and limitations of statistics is considered by Prof. Salvioni, in an article entitled *Ai Confini della Statistica*. The following is a summary of the principal positions taken by the author.

The discussion takes the form of answers to the two questions that are propounded at the outset: (1) Are inquiries (especially social inquiries) a part of statistics? (2) Is the so-called monograph (of the family, shops, etc.) a part of statistics? Statistics and inquiry, it is held, have both the same matter to deal with, and it is the office of both to illustrate the economic and social situation of a country; but this affinity does not suffice to make them identical. Again, “it is the office of statistics to collect social facts of every kind for the purpose of recognizing as *descriptive* the political state, and to explore as *investigative* statistics the social state of the nation.” But even this fact does not identify inquiry with statistics, for in statistics there is a particular element—“the numerical determination of the facts collected”—that is wanting in inquiry. On the other hand, this distinction is not a sufficient mark of differentiation.

By further restrictions we finally get over and above *expositive* statistics, the doctrine of method, or *statistical methodology*. But *inquiry* has also its methodology, which is so like that of statistics as to suggest the problem of “fusion and separation.” Their similarity of method is not confined to any particular kind of inquiry, but has refer-

ence to all inquiries, both public and private. But to solve the problem of "fusion and separation" we must know more definitely what the function of inquiry is, and also whether, considered as a means of social investigation, its expedients are better suited than those of statistics for the discovery of truth. A subordinate question is whether the results of inquiry can enter as statistical data in giving information to expositive statistics.

It is thus found that the relations involved between statistics and inquiry are those of method and results. Put in the form of question the problem may now be more definitely stated: "Does the methodology of inquiry appertain to statistical methodology? Can its results enter into statistical work without altering the character of the latter?"

Before directly answering these questions, Prof. Salvioni critically examines the views of various authors regarding the relation of statistics to inquiry. The distinction, he says, has never been clearly perceived, nor discussed with any scientific precision. Ferraris, however, has touched upon the question more directly than any other writer, but, under the influence of state socialism, he has limited his consideration to public inquiries. These, says Ferraris, are undertaken by modern states in order to learn the conditions of the people, and for this purpose it is helpful to complement them with statistics. He then makes the following distinction between statistics and inquiry: "Statistics," he says, "is susceptible of great extension in time and space, and can pursue its investigations for a long time and upon a vast field. But it always has an irreparable defect,—it is wanting in intensity. Or, although its figures are copious and widely distributed, they are limited to manifesting the exterior aspect of phenomena, and rarely give any sign or indication of the circumstances that accompany them, or the causes that determine them. Inquiries avoid these defects. Having for their subject some special fact they always throw a very clear light upon it; they are made with the greatest publicity, and make use of the knowledge of anyone who knows anything about the subject under investigation, and out of the clash of opinions truth emerges. But while statistics has greater *extensity*, inquiries have greater *intensity*, which, therefore, does not render the former useless, but a precious and very helpful complement to inquiry." Upon this Salvioni remarks that, while Ferraris recognizes the relation between statistics and inquiry, he does not make

any scientific investigation of the difference; and, further, that the distinctions of Ferraris pertain to results rather than method, for it is only in *results* that inquiry is less extensive and more intensive, and this, instead of being a defect, is an advantage.

The views of Gabaglio, Cohn, Meitzen, and others are passed in review, and all are found to be defective. "From the opinions of these authors," says Prof. Salvioni, "there results a nexus, not always definite, between inquiry (especially social and economic) and statistics. The real point of contact seems to be this: Both are instruments of investigating social phenomena. The one treats of or describes *accustomed* phenomena (those which have taken place) and the other attempts to ascertain their *dimensional* functions, but inquiry is satisfied with an indeterminate knowledge, while statistics gives the definite numerical expression of the facts collected. Since inquiry, as well as statistics, starts from social phenomena as the foundation of research, both are a means of observation, and belong, in consequence, to inductive logic,—more strictly to its application to the facts of human society.

"Although, then, the doctrine of inquiry cannot be drawn into the field of statistics, on account of the difference adduced above, and although it cannot be made *subordinate*, it is undeniably *coördinate* with it. In order to exhaust the content of both, it will then be necessary to refer them to a higher category that comprehends each. If, in the authors (above referred to) there is a certain uncertainty, it is easy to explain it by the fact that a *quid statisticum* indissolubly binds itself to and continually accompanies inquiries. Thus, for example: The number of printed questions, the number of those returned without replies, the number lost or thrown away, the sum of the affirmative and negative answers, the number of persons interrogated, etc. Many inquiries, as is well known, have certainly the form, and, indeed, to a certain extent, also the substance of statistics. But this convergence of their concepts does not alter their characteristic distinction, which we have pointed out above.

"Thus far as to the doctrine of statistics. As to the employment of the results of inquiry in statistical work, without changing its character, there seems to be no doubt. Here the consensus of writers is numerous and unanimous. The results of inquiry are truly in part a complement, in part a substitute of statistics, and in both respects can be made a part of *expositive* statistics. Inquiries give more deci-

sive features to abstract laws, or supply lacunæ, and are able to proceed in good fellowship with statistical data."

In brief, according to Prof. Salvioni, inquiry and statistics are related as coördinate departments of the investigation of social phenomena, their results complementing rather than overlapping each other; and their characteristic difference lies in the fact that inquiry is essentially descriptive, and gives only indeterminate information, while statistics seeks to ascertain dimensions, and gives numerical results.

Turning to the second question,—that relative to the monograph,—it is found that there is no definite understanding among writers as to its essence and scope. As understood by our author the monograph is a study of *isolated* (social) phenomena in contradistinction to inquiry, "which studies *all* the facts of a given kind, and which come within the circle of facts and territory of the proposed inquiry: as, for instance, *all* the facts relative to all the unhealthy habitations of a given district; *all* the hygienic and anti-hygienic conditions of the laborers of a definite territory," etc. The monograph, on the contrary, "is a study of *isolated*, but not of *simple*, phenomena," that is, it studies all the facts relating to a given family, workshop, or commune, in reference to some particular feature, such as the delinquents of a family or a commune. Some enthusiasts of the monographic system would extend it so far as to make it include national, and even international, investigations. But this is absurd. It should be confined within rational limits, and within these there is no denying that it will be able to render important service to the investigation of social facts. But the scientific question is: Does the monograph belong to statistical method? According to Prof. Salvioni, it does not, although the distinction is not merely one of number. True, the character of statistics is the numerical determination of numbers, but the family monograph is also concerned with numbers. "Number is only a *formal* element of statistics; for this character alone arithmetic would also be statistics." "The monograph is found at the opposite pole of observation *en masse*, which, to speak emphatically, is the banner under which statistics militates. Besides, to what does statistics aim? To discover the *type* in the variable, the definite in the indefinite, of *numerous social facts*. In the family monograph, on the other hand, the type is presupposed; it is taken at the start, and does not result from an objective elaboration of facts collected,

but from the subjective virtuousness (*virtuosità*) of the collector." "The monograph is a true description, a true natural history of a family, and is given and proclaimed as the *type* of all others."

So far, what has been said of the monographic system has had special reference to the family monograph, but analogous remarks might be made of the monograph of shops (*officina*, i. e., large shops or factories), or the criminal monograph. There is, however, this distinction: that, in the monograph of workshops, we do not find the *immediate* institution of the *type*, but a minute analysis of a *fact*, which is used as a complete elaboration of a *group* of *all* facts of a similar kind. That is, monographs of this kind are the preliminary steps of statistics, but not of statistics *per se*. On the contrary, with the criminal monograph "it is statistics that prepares the ground; analyzing, in various parts of the territory, the general criminality of a nation it finds that some parts are more seriously affected by crime than others. The question then arises: Is the greater criminality due to a more intense dissemination of criminal germs in the given district, or to special and more unwholesome centres of infection? Statistics will furnish the answer, but in case it is due to the latter cause, medical statistics ceases and a clinical history of the case begins. Indeed, the criminal monograph is precisely a clinical study of social pathology. Stated in a word, the monograph of the workshop comes before statistics, the criminal monograph after, but both are outside of statistics."

It is finally concluded that besides the statistical method there are two others,—that of Inquiry and the monograph,—for the inductive investigation of social phenomena. On the one extreme we have inquiry which is descriptive of *all* the social facts in a given territory, and, on the other, a description of *isolated* facts. Between these, as its limitations or boundaries, there is the exact or quantitative method of statistics. Thus understood they become contradistinguished from each other, and freed from that nebulousness with which they have hitherto been surrounded. From these considerations there follows the further conclusion that society may be studied from three different points of view, viz.:—

(a) By the more perfect and precise method of quantitative research in the mass of phenomena, principal or auxiliary,—the statistical method;

(b) By the complementary and substitutive method (in reference

to statistics) of inquiry, which is connected with the preceding through the mass of observations and through its function of *measuring*, but it is distinguished from it through the lack of precision of the *description*, and through the subsidiary and non-systematic application of numbers ;

(c) By the method of investigation by cases, types, or individuals (whether simple or complex, makes no difference), and which is distinguished from the others either because it starts from a type, while they search for one, or through its naturalistic character, that is, following after the model of natural science.

STEPHEN F. WESTON.

SUICIDES IN THE AUSTRIAN ARMY IN THE YEARS 1873-90.

In the last April number of the *Statistische Monatschrift* (Austria) Josef Roth has an article upon suicides in the German army during the period 1873-90 (*Die Selbstmorde in der k. u. k. Armee in den Jahren 1873-90*).

The total number of deaths by suicide in the army during this period was 5808. Of these 3431 occurred in the Austrian division, 1982 in the Hungarian division, and 395 in the Occupation department (*Occupationsgebiete*). This makes 120 deaths per 100,000 for the whole army, of which there were 123 deaths per 100,000 in the Austrian army, 125 in the Hungarian army, and 87 in the Occupation department.

Suicides as a whole are slightly increasing, and the rate for the entire army during the last four years is considerably higher than 120 per 100,000.

Race evidently plays an important part in the number of suicides. In 980 cases taken from regiments in which the different nationalities are kept separate, suicides occur in the following order: Czechs, 17 per cent; Magyars, 15 per cent; Poles, 15 per cent; Roumanians, 14 per cent; Germans, 13 per cent; and Croatians, 8 per cent.

In Hungary and Croatia the army list gives a smaller number of suicides than does the civil list, but in Austria this is reversed, and the number of suicides in private life exceeds that of army life. There seems to be also a difference according to religious belief; the Jews, for example, have the greatest aversion to suicide.

The causes of suicide in the army are numerous, but the greater

number by far is caused by fear of punishment; the next greatest cause is dislike of military service. Of suicides, the causes of which are known, 35 per cent were from the first cause, and 17 per cent from the second. In 41 per cent of all cases the cause was unknown.

It is in the ranks and among the lower officers that the rate of suicides is increasing, and Roth concludes from this that the love of military service is diminishing in some countries. G. N. C.

TEN YEARS' GROWTH OF THE CITY OF LONDON.

Ten Years' Growth of the City of London. Report, Local Government and Taxation Committee of the Corporation, by James Salmon, Chairman. London, 1891. 139 pages.

The Imperial census is that of the night, or permanent, population, and according to it one might be led to infer that the City was on the wane, since it stated the population in 1861 to be 112,063; in 1871, 74,897; in 1881, 50,652; and in 1891, only 37,694. The square mile of territory embraced by the City is bound to become more and more non-residential, particularly for two reasons: first, because of the constantly increasing business demands, raising values and rents beyond what can profitably be paid for tenement purposes; and, secondly, on account of the railway facilities into the suburbs. The City's night population may eventually include hardly anybody but janitors, watchmen, and the like.

The day census introduces one to the true City.—the mercantile and commercial population. This in 1866 was 170,133; in 1881, 261,061; in 1891, 301,384. Of the 301,384, in 1891, 29,520 were employers, 202,213 male employees, and 50,416 females; while there were 19,235 children under fifteen years of age.

A census was also taken of the passenger and vehicular traffic, of carriages and persons entering the City on a fixed day, including those coming by rail, but not including the railway carriages. The number of persons who entered the City on foot or in vehicles between 5 A.M. and 9 P.M. (the day traffic) was 1,100,636; between 9 P.M. and 5 A.M. (night traffic), 85,458, making a total of 1,186,094 for the twenty-four hours. The largest number for a single hour was 132,835, between 8 and 9 A.M., while between 9 and 10 A.M. there were 124,942. The

smallest number was between 2 and 3 A.M., 656. The chief entrance was by way of London Bridge, over which 107,421 came.

The number of vehicles entering the City between 5 A.M. and 9 P.M. was 85,826; between 9 P.M. and 5 A.M., 6,546; or 92,372 for the twenty-four hours. Between 8 A.M. and 7 P.M. the number did not vary greatly, ranging from 5522 to 7860 an hour, the maximum being between 10 and 11 A.M. The enumeration was of persons and vehicles entering the City. Naturally, about the same number must also have gone out, but no account was made of those.

F. A. CURRIER.

WORK OF THE STATISTICAL SEMINARY AT THE UNIVERSITY OF VIENNA.

Bericht über die thatigkeit des statistischen Seminars an der K. K. Universität Wien im Wintersemester, 1891-92. By Dr. Hermann v. Schullern-Schrattenhofen. In the *Statistische Monatschrift*, October, 1892.

We have here a report of the work done in the statistical seminary of the University of Vienna during the last winter semester. The subject chosen for investigation was the statistics of taxation, and the field was divided among the various attendants upon the course. As a result, papers were prepared upon the following topics: 1. The place of an income tax in a system of taxation. 2. The report of the Austrian government respecting direct personal taxes. 3. Income taxes in Saxe-Weimar, Hesse, Saxony, and Hamburg. 4. The abolition of exemptions from real property taxation in Prussia. 5. The taxation of alcoholic liquors in Austria, and its economic effects. 6. The taxation of transfers of stocks and commercial paper. 7. The taxes upon rent in Lower Austria. 8. Austrian municipal finance. 9. International comparative finance statistics.

Of the many interesting statistical tables compiled and presented, only a single excerpt can here be given. For example, the relation of the income tax to other direct taxes in Austria, for the year 1892, is shown on the following page.

The direct taxes produced 18.3 per cent of the total governmental revenue. And during recent years the development of the income tax has been greater than that of other kinds of direct taxes.

Direct Taxes.	Gulden.	Per Cent.
Land tax.....	36,062,000	33.7
Building tax.....	30,200,000	28.3
Five per cent tax.....	1,856,000	1.7
Tax on business profits....	11,284,000	10.6
Income tax.....	26,442,000	24.7
Collection fees.....	720,000	0.7
Interest from delinquents.	318,000	0.3
Total.....	106,822,000	100.0

VICTOR ROSEWATER.

LOCAL PUBLIC RECORDS OF MASSACHUSETTS.

The Report on the *Custody and Condition of the Public Records of Parishes, Towns, and Counties* in Massachusetts for 1892 has recently appeared. In it the Commissioner, Robert T. Swan, makes complaint of the manner in which state laws are neglected by many town and county clerks.

The social position of the state is based largely upon the records furnished by the cities and towns, and the State laws require such records to be scrupulously cared for. In his Report, Mr. Swan shows what little attention these laws have received, and how carelessly records are kept. There has been some improvement since 1890, but in many places the current events are still imperfectly recorded or sometimes grossly neglected. These facts serve to draw our attention to the uncertainty which must accompany our social laws so long as they are founded upon records so poorly managed.

The assessors' records in Massachusetts towns, prior to about 1825, are usually preserved in files or in very small pamphlets. From that time until about 1860 they are kept in larger books, usually unbound. Since 1860 they have been kept in the cumbersome form furnished by the Commonwealth. The records are usually poorly protected from fire and flood, and comparatively few only are stored in vaults.

Mr. Swan makes the usual complaint in regard to the registration of births, marriages, and deaths, which at present is based largely upon a house-to-house canvass. Returns made in this way cannot be reliable, and illegitimate births are sure to be concealed from the canvasser.

G. N. C.

THE CRIMINAL STATISTICS OF BUENOS AYRES.

Provincia de Buenos Aires. Memoria del Departamento de Policía.
1892. Pp. 196; tables.

This account, presented by Guillermo J. Nunes, gives statistics of crimes of various sorts committed during the year 1891 in the Province of Buenos Ayres, classified by five groups, by specific offences, and by jurisdictions. It is suggestive as throwing light upon social conditions in a South American country. Comparisons by ratio with the year 1890, and a comparison by ratio of total criminality with that of various other countries, are given. The account contains also statistics of accidents, suicides, drunkenness, and of matters of minor interest.

As the comparison with other countries does not use the different groups of crimes, a comparison has been made with England and Wales, and a new table has been constructed. A comparison with some country of southern Europe would be more valuable, but the necessary statistics were not accessible.

It must be remembered, as shown by Dr. Robert Giffen,* that for various reasons a comparison of criminality of different countries is not very satisfactory; administration may be more efficient, or laws more numerous, in one country than another. In England "destroying of trees, shrubs, etc., growing" is included among "crimes against property." Such items are omitted in the table.

	Percentage of Total Crimes.		Proportion to 100,000 of Population.		Actual Numbers.	
	Province Buenos Ayres.	England and Wales.	Province Buenos Ayres.	England and Wales.	Province Buenos Ayres.	England and Wales.
Against the Person	46.7	4.7	245	6	1,826	1,634
" property...	44.5	84.1	233	113	1,736	32,543
" chastity...	2.2	3.8	11	5	84	1,489
Sum ¹	93.4	92.7	489	124	3,646	35,866
Total crimes.....	100.0	100.0	524	134	3,902	38,650
Drunkenness.....	.....	.....	1,081	660	8,044	189,746
Population.....	.....	.....	100,000	100,000	744,197	28,762,287

¹ Certain crimes are not included: in Buenos Ayres those peculiar to public employes, etc., and in England those against the game laws, etc.

The numbers for the province of Buenos Ayres are taken from the *Memoria del Departamento de Policía*, 1891, p. 180. The population is from p. 184.

The numbers for England and Wales are from the *Judicial Statistics*, 1890, p. 20, addition and subtraction having been performed to make the grouping as nearly as possible identical with that of the *Memoria*. The number for drunkenness is from p. 26. The population is given as estimated for 1890 in the *Statesman's Year book* for 1892, p. 16.

The numbers are in both cases the numbers of offences taken cognizance of by the police, not the numbers of offenders convicted.

* *Publications American Statistical Association*, Vol. III, p. 200.

L. P. LANE.

THE AVERAGE LENGTH OF LIFE IN FRANCE.

In the *Revue Scientifique* of December 24, 1892, V. Turquan has an interesting article upon the average length of life in France, in which he shows that the average is gradually increasing, both for males and for females. If we take into consideration the total number of years actually lived, the increase in the average length of life may be partly explained by the diminution in the birth rate, a social phenomenon which has occasioned much discussion in the past few years. The explanation of this statement is very simple; the more births there are in a certain determined population the more deaths there are of infants, and in consequence the average of years lived by the entire community is so much less. If we suppose that the number of births is diminished, we may assume that the number of deaths of infants is also less; and, provided that the conditions of life remain the same, this diminished death rate among infants will result in an increased average length of life for the entire community.

In addition to this, however, the increase of the average length of life is affected by the number of old people in the community. If this number grows each year the average length of life will also increase.

In this article Turquan has worked out the average length of life for males and females independently, and for both sexes, not only for the entire country, but also for each of the 87 departments in France.

Fifty years ago the average length of life in France was 32 or 33 years, but the average for the last 32 years is 38 years and 4 months for women; and 36 years and 2 months for men; and 37 years and 3 months for both sexes. This average has increased sensibly during the last few years, and is now above 40 years. This latter increase, Turquan asserts, is due to the effect of hygienic measures, and to the decline of the birth-rate.

The different sections of France show different averages, and, as might be expected, these are lowest where sanitation is poorest, and where births are most numerous. These averages vary from 28 years and 1 month to 51 years. The difference between the averages for men and women is greatest in the western part of the country. The reason given for this is that the male portion of the population is mostly composed of sailors or fishermen.

The following table shows the average length of life by periods : —

<i>Period.</i>	<i>Average Length of Life.</i>		
1806-1810,	31 years	6 months.	
1811-1815,	31 "	10 "	
1816-1820,	31 "	10 "	
1821-1825,	31 "	5 "	
1826-1830,	32 "	5 "	
1831-1835,	33 "	6 "	
1836-1840,	34 "	11 "	
1841-1845,	35 "	0 "	
1846-1850,	36 "	0 "	
1851-1855,	36 "	8 "	
1856-1860,	36 "	4 "	
1861-1865,	36 "	5 "	
1866-1876,	37 "	3 "	
1877-1886,	40 "	2 "	

The following table also shows the effect of the increase in the length of life for males : —

From 1820-1830, for each 100 births there were in 20 years 59.5 living.

" 1831-1840, " " " " " " " "	61.7 "
" 1841-1850, " " " " " " " "	60.7 "
" 1851-1860, " " " " " " " "	61.5 "
" 1861-1870, " " " " " " " "	62.6 "
" 1871-1880, " " " " " " " "	62.1 "
" 1881-1890, " " " " " " " "	63.0 "

The higher average for women is due to the fact that the mortality among male children is greater than among female children, and that more women live to an old age than do men.

G. N. CALKINS.

NOTE FROM MR. FRANCIS GALTON TO MR. GEORGE K. HOLMES
ON THE SUBJECT OF DISTRIBUTION.

62 RUTLAND GATE,

LONDON, OCT. 17, 1892.

DEAR SIR :

I have read the paper on "Distribution" in the *Publications of the American Statistical Association*, which you were so good as to send me, but it strikes me that an "Index of Inequality" could be got in a simpler and yet more exact way, as follows: I take the figures from the 2nd and 3rd columns of the Maryland part of Table III, p. 150, having first reduced the 950 owners to 100, and the amounts owned proportionally, multiplying both sets of entries by $\frac{1}{9.5}$. I have also only cared to work to the nearest 10,000 dollars.

A. Number of Owners.	B. Amounts Owned.	C. Amounts that would have been Owned if each Person had the same Amount.	D. Inequalities, that is to say, the Differences between B and C, irrespective of Sign.
25	\$10,000	\$180,000	\$180,000
20	20,000	152,000	132,000
19	30,000	144,000	114,000
13	50,000	90,000	49,000
11	90,000	84,000	6,000
7	120,000	53,000	67,000
3	110,000	23,000	87,000
2	330,000	15,000	315,000
100	\$760,000	\$760,000	\$930,000

Whence —

Mean amount owned by each (E), \$7600.

Mean inequality (F), \$9500.

Index of inequality = $\frac{F}{E} = 1.25$.

For some purposes F alone might be wanted; for others, F and $\frac{F}{E}$. E is, of course, implicitly given in the latter case.

Permit me to criticise the terms of your query in p. 141, viz., "Is wealth more widely, evenly, and generously distributed in . . . ?" Either those three adjectives mean the same thing, or they do not. If they do, two of them are superfluous, and, in fact, I have assumed them all to mean *evenly*. If they do not, your query involves three independent variables, and could not be answered without explaining how they are to be rendered commensurable.

Yours faithfully,

FRANCIS GALTON.

The preceding letter from Mr. Galton will attract attention, not only because it comes from the most eminent authority on mathematical measures of distribution, but because of its original process of computing index numbers. An accurate measure of the inequality of the distribution of wealth within a group of wealth owners is the problem, and the solution proposes to ascertain the inequalities of the actual distribution as compared with a perfectly even distribution, and to establish the ratio between the average individual holding and the average individual inequality. It is an attractive scheme, and I have made some computations to discover comparative results.

The index numbers that measure the distribution of the amount of certain classes of government bonds among male, female, and total holders in 1880, in Maryland, are these : males, 1.253 ; females, 1.249 ; total, 1.255.

The table of facts from which these index numbers are computed is published in the issue of the *Quarterly Publications of the American Statistical Association*, for June and September, 1892. Upon comparison of the index numbers, it is evident that they must be computed without approximations, because their differences are so small. These are often not found until the third decimal place is reached.

Until a standard is agreed upon, a scheme for measuring the distribution of wealth can be criticized only by subjecting it to mathematical judgment, and by determining whether it is practically consistent in its results. A distribution in which one person owns \$1000 and another \$100,000 would seem to be half as unequal in degree as one in which one person owns \$2000 and another \$200,000. Mr. Galton's index number, however, is the same in these cases, since the average holding and the average inequality are precisely doubled by the doubling of the actual holdings.

The average inequality does not always vary with the index number, and its use is not clear. Whether a group is composed of nine persons worth \$2000 each, and one person worth \$1,000,000, or is composed of one person worth \$2000, and nine persons worth \$1,000,000 each, makes no difference with the average inequality, although it does with the index number.

Since the average in this scheme does not preserve the distinction between rich and poor, the question arises whether it may not produce an erroneous index number of inequality of distribution.

Perhaps I have not sufficiently experimented with this scheme to

be sure that its application to the groups of wealth owners mentioned above does not lead to objections that are more apparent than real.

Regarding Mr. Galton's criticism, that the measure of the distribution of wealth proposed by me employs three independent variables, the reply may be made that the distribution of wealth has these three aspects:—

1. All individuals of the population do not own wealth. Less than half of the people possess wealth in sufficient quantities to be worth an account, and the proportion of the owners ought to be represented to measure what I have termed the width of distribution.

2. Another measure is wanted to determine the inequality of the distribution of wealth, not among all the people, but among its owners. An index can be computed that is a compound of width and of inequality, but it seems to me to be undesirable.

3. The generosity of distribution calls for a third measure. There may be no substantial difference between two communities in respect to the width and the inequality of distribution, but one community may have much more wealth than the other. The average, or Mr. Galton's E, affords this measure.

GEORGE K. HOLMES.

REGISTRATION REPORT OF MASSACHUSETTS.

Fiftieth Report of Births, Marriages, and Deaths in the Commonwealth, and returns of Deaths investigated by the Medical Examiners, for the Year 1891. Pp. 145. Boston, 1892.

To those who are familiar with the precise and elaborate registration reports of Massachusetts, the report of 1891 will be a surprise and a great disappointment. We are at a loss to account for the change from a compilation which has been universally accepted by statisticians as a model of tabulation and presentation to the present inadequate number.

The reports of previous years were compiled for the use of statisticians as well as for the general public. This, as the editor says, is no longer the case. A student of social science must either go without data hitherto furnished or else laboriously work them out for himself. The principle upon which the work is compiled is expressed on page 113, as follows: "It is not intended, however, in this report to pre-

sent all the elaborate tables heretofore presented where data are arrived at by an unending series of sums in long division, and by permutations and combinations of figures, which data are, if to anyone, of value only to the statistician who might well himself devote the time and labor necessary to ascertaining the facts desired." This paragraph clearly indicates that the compiler has little sympathy for statisticians, and chooses to ignore their usefulness. He forgets that by working out these data himself, with all the necessary figures at hand, one man may do the work which perhaps otherwise scores of statisticians will have to do individually, and with much greater labor. To a limited extent he works out these data for the "average reader" in a portion of the report entitled "editorial observations." Here he puts together various facts derived from data in the files of statistics kept at the office of the Secretary of State, and these facts he puts down in words, in one or more paragraphs, instead of in figures, as heretofore. For example, on page 115, he makes the statement that the excess of living births over deaths is greater than the excess in any year since the beginning of registration. This fact should be contained also in a table, which at the same time would contain many other facts not mentioned in any paragraph of the report, such, for instance, as the rate of increase of this excess, its relation to the entire population, etc.

Such a method may do for the "average reader," but in a branch of social science, such as vital statistics, the "average reader" is scarcely concerned. Only a small portion of the population ever read the registration report, if, indeed, they know of its existence. As for those who do read it, it may be asserted that they have more use for the tables, which represent so many and such diverse ideas, than they can have for a worded paragraph which represents but one idea of one man. Different people see the same thing in different lights, and thus it may come to pass that one table of statistics can represent a variety of ideas which could be brought out by different people, and all of which would not be conceived by an ordinary compiler of statistics.

Another deviation from regular statistical methods of presentation is shown by the following paragraph from page 113: "It has been thought wise not to attempt to draw inferences, or make ratios and percentages from uncertain data, such, for instance, as an "estimated "

population. Such an "estimate" must of necessity be inaccurate as a basis of figuring decimal percentages, and the results obtained are of no more actual value than percentages calculated on the previously ascertained population, as shown by state or national census." This is entirely contradictory to the opinions of the most experienced and ingenious statisticians of England and the United States, and the subject has been investigated and described with the greatest care and thoroughness. The importance of rates based upon "estimated" populations is sufficient to warrant their acceptance by statisticians in all countries, and they form a common basis for the comparison of the social status of nations. The editor criticizes estimates of population by showing that such estimates, made in different years, are not the same, and he gives in illustration the comparison of the estimates of population for 1887 in the 1889 report and in the 1890 report. These estimates are 2,058,647 and 2,060,861, respectively, and the corresponding death rates are 19.80 and 19.78. The difference in the estimates of population amounts to about one-tenth of one per cent, and the difference in death rates to about one death in 50,000 persons. According to his method of computing the death rate for 1887, the difference in rates would be 1.21 per 1000, or 60 times greater than the difference which he criticizes. Such criticism is far-fetched. Indeed, the next refinement would be the abolition of all rates, because no census, whether state or national, can be absolutely correct. Rates based upon one stated census for a period of years would be worse than useless, for they *must* be invariably false, since the population for different years is never the same.

In all countries it is generally admitted that the population may be supposed to increase during a certain time at the same rate, as it did during the preceding intercensal period, although this of course cannot be strictly estimated where there is a moving population due to migration. Estimates are approximate, however, and serve to show the general increase of population with sufficient accuracy for comparison. Thus, in the Registration report of England for 1890, the Registrar furnishes the following table, in order to show the small divergence between death rates per 1000, derived from estimates of population based upon the preceding intercensal rate of increase and those derived by regular increase of the population, as shown by a later census:—

1.	2.	3.	4.
Year.	Rates Based upon Population Estimated from Intercensal Period 1871-81.	Rates Based on Increase, as shown by the Census of 1891.	Difference between the Rates in Columns 2 and 3.
1881	18.88	18.89	0.01
1882	19.56	19.62	0.06
1883	19.54	19.64	0.10
1884	19.51	19.66	0.15
1885	19.01	19.21	0.20
1886	19.28	19.52	0.24
1887	18.79	19.07	0.28
1888	17.80	18.11	0.31
1889	17.87	18.22	0.35
1890	19.12	19.55	0.43

From this table it is seen that the differences between original estimates and those based upon a later census are in no case greater than .35 per 1000 (the rate for 1890 is based in the report for that year upon the census of 1891), or about one death in 3000 persons, and such a difference may, for all practical purposes, be disregarded.

Now, while statisticians of all countries are agreed that estimates based upon rates of increase during the last intercensal period are legitimate, there is a variety of methods employed to get these rates of increase.

In a country where births exceed the deaths the population should increase by regular geometrical ratio, like compound interest; but in a country where the population is constantly changing by migration this rate is not accurate; for this reason it has been the custom to assume that the rate of increase during intercensal years has remained the same as that of the last preceding intercensal period. Some statisticians call this annual increase the n th part of the entire increase in population during the period of n years. Thus, if the increase in population of Massachusetts for 5 years is 500,000, the yearly increase, according to this method, would be 100,000. Such a method, however, is not so exact as to consider the increment of population an increasing quantity during the intercensal years. Calling r the annual increase per unit of population, we should have at the end of one year $1 + r$, and at the end of the second year the increase would be denoted by $(1 + r)^2$, and at the end of five years the increase would

be denoted by $(1+r)^5$. The annual rate therefore derived from the increase in five years is the 5th root and not the 5th part of the quinquennial rate of increase. This can be expressed as follows: let P denote the population at any time, and P^1 the population at any previous time, and n the number of years between P and P^1 , then $\sqrt[n]{\frac{P}{P^1}} = r, 1 + \text{annual rate of increase.}$

Of these methods the latter is used most extensively where careful estimates are required, and is usually employed in England for the estimation of the population during the intercensal years. In Massachusetts, on the other hand, the former method has been used of late years, and the report of 1890 contains a table of the estimated population during intercensal years between 1845 and 1890. For a few years (1881 to 1885) the population was estimated in the reports for those years by the numbers of assessed polls; the figures, however, derived in this way, are not so trustworthy as by either of the above methods. The following table shows the difference in these two methods for the 10 years 1880-90:—

	Arithmetical Estimate.	Geometrical Estimate.	Difference.
1880*	1,783,085	1,783,085	.....
1881	1,814,806	1,813,820	1,076
1882	1,846,707	1,845,084	1,623
1883	1,878,518	1,876,887	1,631
1884	1,910,329	1,909,237	1,092
1885*	1,942,141	1,942,141	.....
1886	2,001,501	1,998,174	3,327
1887	2,060,861	2,055,191	5,670
1888	2,120,221	2,115,131	5,090
1889	2,179,582	2,176,150	3,432
1890*	2,238,943	2,238,943	.....

* Census year.

These differences would affect but little the computations of rates, etc. It is better, however, to indicate the more approximate population. Death rates based upon arithmetical estimates are a little too low.

According to the geometrical formula given above, and assuming that the rate of increase of population of Massachusetts is the same as it was during the period 1885 to 1890, we find the population of 1891 equal to 2,303,537. Having given the number of deaths 45,185,

we find the death rate is 19.61, instead of 20.18, per 1000 of the living population. The birth rate, too, should be 27.35 instead of 28.15, and the excess of births over deaths should be 7.74 instead of 7.97. The marriage rate should be 9.41 instead of 9.68.

Compared with the estimated population, the death rate from scarletina should be 1.068 per 10,000 instead of 1.097, and this rate is smaller than any previous rate, except for the years 1889 and 1890. The mortality from typhoid fever should be 3.5 per 10,000 of the entire population instead of 3.7, and this rate is less than that for any year for the last 30 years. The mortality from cholera infantum is 12.02 per 10,000 instead of 12.3. The rate for deaths from diseases of the kidneys should be 6.5 per 10,000 instead 6.4. This error is due to careless computation by the editor, and according to his method it should be 6.6.

Throughout the report the editor makes the mistake of comparing the rates for 1891, based upon the census of 1890, with those of previous years, which are based upon estimated populations. To be consistent he should have worked out these rates according to the population as given in the different census years.

The estimated population for 1891 accordingly makes erroneous certain statements in the registration report. For example, the marriage rate is greater than that for any year since 1887 instead of 1883. The death rate is higher than that for any preceding year since 1888 instead of 1875. One person was married to every 52.17 of the population instead of every 51.6. The statement is made that there were more deaths under one year in 1891 than in any other year since the beginning of registration. This conveys an erroneous idea, for we should compare by rates rather than by absolute figures. The rates for deaths under one year for 1891 was greater than that for any year since 1874.

On page 119 of the Report the number of widowers who married maids in 1891 should be 1829 instead of 1827, according to the tables on page 25, and the number of widowers married should be 2778 instead of 2841; and, according to these same tables, the number of widows married in 1891 should be 1890 instead of 1940.

Still further inaccuracies might be noted; for example, the death rate according to the population of 1890 is given as 20.18 per 1000, on page 115, and 20.13 on page 122. Also, 1891 on page 128 should be 1890. On page 122 there is a gross error in proof-reading, the

decimal point being misplaced in twelve cases. But these are minor errors, and might occur in the best of reports.

These few facts are sufficient to show the inadequacy of the registration report. A few tables are probably accurate, but the numerous errors throughout the volume necessarily make one sceptical in the use of even these. As a means of showing the position of Massachusetts in 1891, relative to that of previous years, the report is almost worthless, and equally so for comparisons with the social conditions of other states and countries. It is much to be regretted that the report of 1891, in the series of valuable and instructive registration records of Massachusetts, can be used with so little confidence.

G. N. CALKINS.

THE NECESSITY OF A REVISION OF THE CLASSIFICATION AND
NOMENCLATURE EMPLOYED IN THE VITAL
STATISTICS OF MASSACHUSETTS.

By S. W. ABBOTT, M.D.

Part of a Paper read before the Massachusetts Medical Society, June 8, 1892.

In the following paper I do not propose to treat exhaustively of the subjects of the medical nomenclature and classification of diseases, but rather to introduce the subject in a suggestive manner with the view of asking the question whether any changes are necessary, and if so what changes, in the classification and nomenclature now employed in the registration of deaths in this state.

What are the primary objects of the classification and nomenclature of diseases? An English writer has clearly said, "a good classification aids and simplifies the registration of diseases, helps toward a more easy comparison and knowledge of them, and toward the storing of experience respecting them, and facilitates the discovering of general principles from the collected, grouped and compared phenomena."¹

In addition, medical nomenclature and terminology furnish the means for separating and distinguishing diseases and causes of death. Thorough registration must depend to a considerable degree for its efficiency upon the perfection of these means. The classification of diseases or causes of death differs little, if any, in its objects, from

¹ Elements of vital statistics. Arthur Newsholme, M.D., London, 1889.

the great systems of classification employed in the different departments of biology.

* * * * *

Two centuries ago the classification and nomenclature of disease was widely different from that of today. Who can tell how far that of today differs from that which will become the admitted classification of two centuries hence? This want of uniformity interferes with the interpretation of medical statistics, especially when such statistics cover a long period of time. So far as the larger groups or divisions are concerned, there is no way of avoiding this disturbing cause.

The classification of the seventeenth century can scarcely be called a classification. In the mortality statistics of the city of London, compiled by Capt. John Graunt of the Royal Society, and embracing the period from 1629 to 1660, no classification is attempted, and while the nomenclature includes many terms which are still in common use, there are many others which contribute quite largely to the mortality lists, which have no place in modern nomenclature. The following are a few of these terms: Impostume, Chrisoms, Jaw faln, Calenture, Planet, Flox, Livergrown, Woolf, Rising of the Lights. Some of these were indicative of a superstitious origin, others were merely the names of symptoms and not of diseases.

In the next century, the eighteenth, Cullen attempted to bring order out of confusion by proposing four general divisions or classes of disease. This was a decided advance beyond the confused methods of his predecessors, and his four classes of (1) The Pyrexixæ, (2) Neuroses, (3) Cachexixæ, and (4) Locales served to a considerable degree as a basis for the modern nosology of the present century, that of the Royal College of Physicians, now in common use among English speaking physicians.

* * * * *

The international importance of a conventional system of medical nomenclature and classification becomes yearly more apparent, and the subject forces itself to the front in the great scientific bodies which convene at regular periods throughout the civilized world. The International Medical Congress, the International Congress of Hygiene, and the International Statistical Congress have all deemed the subject worthy of consideration. It is in these bodies that the foremost men of science of different nations often come in contact, and opportunities are offered for comparing and unifying existing methods of work.

The following governments and authorities now have the most complete and thorough system of registration of vital statistics: —

Great Britain, the collection of whose vital statistics is made by the Register General.

Germany, by the Royal Health office.

Italy, under the direction of the Department of Agriculture, Industry and Commerce. Prof. Bodio.

France. Published by the Consulting Committee of Public Hygiene.

Austria. The Royal Central Statistical Commission.

Hungary. The Weekly Bulletins of International Statistics. Prof. Josef Körösi.

Belgium. The résumé of demography and medical statistics by Dr. E. Janssens.

Sweden. Government Medical Statistics.

Switzerland. Monthly and yearly Bulletins of the Statistical Bureau of the Confederate Cantons.

To these should be added the mortality reports of the ninth, tenth, and eleventh censuses of the United States (the latter being now in course of publication), and the registration reports of such of the older states as have established a system of registration.

Defects of our present system of registration. During the past ten years or more several earnest attempts have been made, in which members of this society have occasionally taken a prominent part, to secure in Massachusetts a Medical Practice Act, which would secure, both to the profession and to the people at large, such advantages as are enjoyed in other states having similar Acts in force. No greater argument could be found for the enactment of such a statute than that which may be found in a careful perusal of the certificates of deaths which are annually returned to the state authorities. Herein is also a standing argument for better medical education.

How may this defect be remedied? In the first place, the nomenclature and classification should be made to conform to the progress of medical science. Secondly, more thorough medical education should be constantly encouraged. Thirdly, the administration of the collection of vital statistics should be improved. The first authority to receive and collect the individual certificates of death from undertakers and physicians is the registrar in cities and the clerk in towns. A decided improvement has been effected in recent years by adding the authority of the local Board of Health, so that the registrar or

clerk becomes the supervisor or collector of certificates of death, while the Board of Health issues permits for burial. But unfortunately, in at least one hundred and fifty towns in the state, no Board of Health exists, except the *ex-officio* Board, the Selectmen, a Board which is never elected in consequence of its expert knowledge of vital statistics. In some of the southern countries of Europe local inspectors are appointed (*leichenbeschauer*), whose duty it is to inspect or visit every household where a death has occurred, and see that the certificates of death are properly returned. An army of such officials would hardly be in keeping with our own form of government, but a decided improvement might be made by requiring that all certificates of death in small towns should be submitted to some district medical authority at stated intervals, such authority to have power to return all deficient or erroneous certificates for revision to the original signers. Several thousand such letters of inquiry are annually issued in England for the purpose of correcting the returns. In addition to these improvements, the entire work of registration should be placed under efficient medical supervision.

Let us now examine briefly the system of classification in general use in Massachusetts, which was copied almost identically in 1855 from that adopted in England, and is nearly the same as that advised by Dr. Farr, well known as the foremost English authority in his day.

The general divisions adopted are five in number : —

1. Zymotic Diseases.
2. Constitutional “
3. Local “
4. Developmental “
5. Violent Deaths.

In this connection these should all be considered as groups of causes of deaths, and not as diseases.

For example, the entire fifth group is composed, not of so many names of distinct forms of disease, but of different modes of death by external causes, or, in other words, by violent means.

In the class of Deaths from Developmental Causes, *old age*, for example, a most common term in death certificates, cannot be called a cause of death, much less a disease. It is simply a period of life, and the use of the term in certificates is simply a confession of our inability to give an exact statement of the true cause.

Let us now examine the list more closely.

The first question I have to propose is whether the term *zymotic* as a general name of the first class or division may not be supplanted by some term which is better adapted to the progress of medical science.

Does the term *miasmatic* properly describe the diseases of the first group of Class I?

Does not typhus fever belong in the primary list?

Anthrax, fifty years ago, was a synonym for Carbuncle. Is it so considered at the present day?

Should not such terms as Metria and Nephria, now obsolete, be dropped from the list?

Should not the term Intermittent Fever be introduced into the primary list? (Ague scarcely covers the exact meaning.)

In Class II of the list now in use (Constitutional Diseases) may be found the most destructive of all diseases in our climate and in our state (Tuberculosis). It was placed in this class according to the belief of the profession of fifty years ago. Does not modern observation, and a more intimate knowledge of its history, require that it should be placed in the First Class with other infectious diseases?

Under Class III (Order 1), nervous diseases, we find at the head of the list the very indefinite term Cephalitis. Just what is meant by this term it would be difficult to tell. It appears to be employed at present as a convenient omnibus into which are packed all deaths from diseases of the brain which cannot be otherwise classified. More than six thousand persons (or over two per cent of all deaths) are said to have died of Cephalitis in Massachusetts in the five years ending with 1890.

In the same list of nervous diseases no place is given to deaths from diseases of the spinal cord, except those which may be included in the meaningless &c. at the end of the list.

In the division of diseases of the organs of circulation, Class III, the deaths attributed to heart diseases appear to have increased from a total of 352 in 1850 to 3417 in 1890, and when these numbers are compared with the living population at those periods, we find that the actual increase amounts to nearly five-fold.

Two causes may be stated for this apparent excessive increase. One is the tendency in later years to more accurate diagnosis on the part of educated and intelligent medical men. Many deaths were

certified in the earlier years of registration, as deaths from dropsy, a term now very much less used, the disease being stated instead of the symptom. Another cause exists undoubtedly in the fact that in the past ten years the term "heart failure" has taken so strong a hold as to be employed in many certificates where no disease of the heart existed, either functional or organic. Some heroic remedy is needed for the cure of this evil.

These are but a small portion of the defects to which I have called your attention. Others exist in the employment of mere symptoms in place of the names of diseases, as in the terms paralysis, convulsions, dropsy, and also in the use of such indefinite terms as hemorrhage, tumors, &c. On the other hand, it must be acknowledged that very great improvement has taken place in this direction in the past fifty years of registration. The ratio of deaths certified as having taken place from unknown or indefinite and ill defined causes has diminished from 5.7 per cent in 1868 to 1.2 per cent in 1890.

The mortality attributed to diseases of the kidneys in Massachusetts in 1850 was only 18, while in 1890 it had increased to 1273. It is not to be understood that this enormous increase of more than sixty fold, and more than thirty fold when compared with the population, is an actual increase, but is due to better medical education, and especially to a more correct diagnosis. The same is true of diphtheria, a term which has no place whatever in the registration returns until 1858. We are not, therefore, to understand that diphtheria (a disease which is very carefully described both by Hippocrates and Aretæus) appeared for the first time in Massachusetts in 1858.

The registration of the causes of death in any community, whether it be a city or a nation, furnishes the basis for sanitary work, since it is by means of the comparison of the registration returns of different countries and different cities that we are enabled to judge of the comparative prevalence in them of those diseases which are, in some degree at least, within the control of mankind, and hence are preventable. A thorough and efficient registration offers to us the opportunity of studying the effect of many conditions upon the health of the people, such as the conditions of sex, different age-periods, density of population, occupation, civilization, intemperance, locality, seasons of the year, and other physical agencies. Hence it is that the machinery of registration, the nomenclature and classification, should be in harmony with the progress of medical science.

AMERICAN STATISTICAL ASSOCIATION.

NEW SERIES, No. 21.

MARCH, 1893.

OBSERVATIONS ON THE MEASURE OF CHANGE.

BY CHARLES H. COOLEY.

It is clear that one who attempts to study precisely things that are changing must have a great deal to do with measures of change. Now, almost all those phenomena of society with which the statistician is chiefly interested are in constant motion, cannot be caught and pinned down permanently in one place, but must be taken on the wing and their velocity measured. Next to their present position their direction and velocity are the most important things to be known about them, since these alone give us any power to forecast future positions.

It is to be noted in regard to measures of change that, like all other measures, their usefulness depends very much on the degree in which they facilitate comparisons. As we use feet and inches to get a precise notion of the relation between two lengths, so we need a standard measure that shall enable us accurately to compare the magnitude of various changes. A rude measure of change is obtained by a simple statement

of the difference between the two states of the quantity studied, as when we say that the population of the United States increased some twelve millions during the last decade. But this does not enable us to tell whether the increase in the length of railways, supposing that to be known, kept pace with the population or not; does not even answer satisfactorily the question how the increase of negroes, some 885 thousand, compares with that of the population as a whole. We want to be able, if possible, to say this change is equal to that; this is twice as great or a half greater; this the same but in the opposite direction, etc.

A measure intended to supply this need is actually in use in statistical work. This is the per cent of increase, or, more accurately, the ratio between two stages of a quantity. The colored population, it would appear, increased only about 13 in the hundred, as against 25 in the hundred for the population in general. Ohio grew about one per cent faster than New York, and about seven per cent slower than Pennsylvania,—comparisons impossible without some standard measure of change. Clearly the idea here is that of finding the relation between the magnitude of the change and that of the quantity changing, and using this relation as a means of comparison. "For its size," Detroit grew much more than New York, though less than Chicago.

I take it that, leaving aside a very few thoughtful students, this relation computed in the ordinary way is accepted as being in truth what it apparently purports to be, an absolute and true measure of change. An increase of 50 per cent is twice as great as an increase of 25 per cent, and equal, though differently directed, to a decrease of 50 per cent. In the ordinary statistical presentation of such facts there is everything to corroborate this notion, and nothing to warn against it.

Yet surely it may readily be shown that the notion is altogether erroneous. Suppose, for example, that during the past ten years a certain city changed in population from 20

thousand to 40 thousand, while another changed from 40 thousand to 20 thousand. It is axiomatic that these changes are equal though of opposite direction; are negative equivalents. Occurring successively ^{in the order} in the same city, they would bring it back precisely to its first state. Yet, in the column headed "per cent of increase or decrease" these changes would appear as an increase of 100 per cent, and a decrease of 50 per cent, respectively. If prices were the subject of study, changes of from 20 cents to 40 and the reverse would be expressed in the same way. If these per cents were now added together and averaged, as is commonly done in this latter class of researches, we should have for the two prices an average increase of 25 per cent,—an absurdity sufficient to cast the darkest suspicion on the whole process. Changes from 20 to 30 cents and back will yield an average increase of over 8 per cent, another contradiction of the axiom *ex nihilo nihil fit*. As we have in each case a mean increase, one may suspect at once that this method makes increases appear greater, as compared with decreases, than they really are.

Such inconsistencies as these have by no means passed unobserved, though from the small recognition they receive in statistical practice, it would appear that the perception of them is not at all general. Prof. Jevons, as is well known, favored and practiced the treatment of such ratios by the method of geometric means. Before speaking of this method, however, I wish to apply the test used above to the method of harmonic means, which has also been proposed. In the first number of the *Quarterly Journal of Economics*, page 83, Mr. F. Coggeshall presents some acute criticisms upon the method of Jevons, shows that the harmonic mean produces results in some respects less objectionable, and seems to suggest the use of the latter wherever the greater difficulty of computation does not preclude it. Suppose, however, we test the harmonic mean by the axiom already suggested, that

a true measure of change must show the equality of equal changes. The formula for this mean is —

$$\frac{1}{x} = \frac{\frac{1}{a} + \frac{1}{b} + \dots + \frac{1}{m}}{n}$$

where a , b , etc. are the ratios or per cents to be averaged, n their number, and x the required mean. Applied to the case of two prices mentioned above, undergoing equal but opposite changes, this method would show, where the changes are from 20 to 40 cents and back, a mean decrease of 20 per cent. Equal changes of 10 cents give a mean decrease of nearly 8 per cent. Instead of the mean condition remaining unchanged, as is actually the case, it is represented as falling from 100 to 80 in the first case, or 92 in the second.

As I have never seen the question treated from precisely this point of view, I venture to offer a tabulated statement of the effect of treating pairs of equal changes by these two methods.

A TEST OF MEANS BY PAIRS OF EQUAL CHANGES.

Equal Changes.	Common Expression of Changes.	Arithmetic Mean.		Harmonic Mean.	
		Mean.	Error in Mean.	Mean.	Error in Mean.
20-21	100-105				
21-20	100-95.2	100.1	+1	99.9	-1
20-22	100-110				
22-20	100-90.9	100.5	+5	99.5	-5
20-24	100-120				
24-20	100-83.3	101.7	+17	98.4	-16
20-26	100-130				
26-20	100-76.9	103.5	+35	96.6	-34
20-30	100-150				
30-20	100-66.7	108.3	+83	92.3	-77
20-40	100-200				
40-20	100-50	125.0	+25.0	80.0	-20.0
20-60	100-300				
60-20	100-33.3	166.7	+66.7	60.0	-40.0

From the point of view here taken it certainly seems that one might draw from these facts two propositions, namely,—

1. That the common method of averaging ratios or index numbers by the arithmetical mean exaggerates increases relatively to decreases; and this so much that it is unfit for use, except where the degrees of change are minute.*

2. That the method of the harmonic mean exaggerates decreases relatively to increases in an almost equal degree, and is similarly unfit for use.

The use of the geometric mean in connection with these ratios or index numbers is not so readily assailable. This mean, of course, is that obtained by multiplying together the several quantities to be averaged, and taking that root of their product whose index is the number of quantities. Thus, if there are three quantities the cube root of their product is taken. The use of logarithms makes this process nearly as easy as that for the arithmetic mean. Applied to pairs of equal changes it will always justify itself by showing no change in the mean,—as may readily be ascertained by averaging in this manner the ratios in the second column of the table. This, to be sure, does not prove the method correct, but only that its errors, if there are any, enter equally into increases and decreases. It does, however, make a strong probability in its favor. Indeed, one may say, without pretending to great mathematical insight, that it seems reasonable that the mean force of a number of quantities *as multipliers* (ratios being such) is obtained by that method which averages them as multipliers, that is, by the method of geometric means.

But there is certainly something unsatisfactory in the results of the geometric mean. Mr. Coggeshall perceived

* Unless I am mistaken, even Prof. Falkner has been misled by the use of this method. On p. lxviii of his recent admirable Report to the Senate Committee on Finance I read: "The result of such a calculation [for a mean of index numbers] * * * is 100.31 as the ratio for these special industries. This is a confirmation of the results," etc.; the ratio being taken as showing a slight mean increase. Of course, this increase is unimportant in any case, but is it not also entirely fictitious? I find the geometrical [true?] mean of these ratios to be 100.00+. *It is the inevitable and persistent tendency of this method, even in the ablest hands, to make increases appear where none exist, and even to change real decreases into apparent increases.*

this when he wrote the criticism above mentioned, but it does not seem to me that he indicated the true nature of the difficulty. I imagine that I can suggest where this difficulty lies, even though I cannot propose a satisfactory remedy.

Does not the trouble arise from the confusion of two distinct questions? These are. I think, first, What is the proper way of obtaining the mean of a series of ratios? and, second, What is the best way to measure changes? To the first question I should answer that the use of the geometric mean affords the only correct method of averaging ratios (or index numbers, which are nothing different), and for proof of this I would point to the considerations that have already been brought forward, and to many others that might be. To the second I should answer that the use of ratios for the measurement and comparison of changes, though mathematically justifiable, is open to serious practical objections. These are the difficulty of understanding and the inconvenience of applying the methods by which alone these ratios can correctly be compared with one another. As already suggested, an increase of 50 per cent is not at all the negative equivalent of a decrease of 50 per cent, nor has it twice the value of an increase of 25 per cent. These relations are inevitably suggested to the unthinking mind by the usual statistical presentation of facts of change, especially by those decapitated quantities contained in columns headed "Per cents of increase or decrease." But no such relations exist. The change negatively equivalent to an increase of 50 per cent is expressed by that ratio which, multiplied by 1.50, will produce unity, namely, .67. The ratio expressing a change having half the value of an increase of 50 per cent is found only by extracting the square root of 1.50. As a means of exposition, then, of expressing to the ordinary mind the comparative value of changes, this method is open to the gravest objection.

If a way could be devised by which these comparisons could be made in the simple and direct manner that we use

in comparing measurements of length or weight, it would, I think, be of the greatest usefulness, and do away with much misunderstanding.

I have myself made some use of a method of denoting the relative value of changes which, though not invulnerable on the mathematical side, renders possible a more simple and direct comparison. That it can be made widely useful I would not venture to assert. It is reached in the following manner.

It has already been suggested that the idea underlying the measurement of changes by per cents is that of finding the relation between the magnitude of the change and that of the quantity changing. In the ordinary method this relation is expressed as the per cent giving the magnitude of the change as compared with the first state of the quantity. But why the first state? Why is a change of from 100 to 150 a change of 50 per cent rather than of 33.3 per cent? There seems no reason in the nature of things why the first state should be chosen as a base rather than the last. The quantity in question has varied, according to some unknown law, from 100 to 150. If a single number is to be chosen as a representative of its magnitude during this period, surely that number should be neither of the extremes, but one representing the mean or average condition,—say 125. The method, then, is to base the per cent of change not on the first state of the changing quantity but on the mean between the two states. The following advantages may be claimed for this plan:—

Equal increases and decreases will be represented by the same per cents. A decrease of 50 per cent will be in fact the negative equivalent of an increase of 50 per cent. Thus, a change from 100 to 200 will be represented by $+.67$, the reverse by $-.67$. An immediate and exact ascertainment of this relation of equality, the most important of all, will be possible.

The true relation among various changes will be approxi-

mately represented by the simple arithmetical relation among the per cents of change. The difference between the two methods in this respect may be shown as follows.

The change from 100 to 200 may be regarded as the sum of the following changes: 100-114, 114-136, 136-180, 180-200. These would be expressed by the following per cents:

Change.	Common Expression.	Proposed Expression.
100-114	14 per cent.	13.1 per cent.
114-136	19.3 "	17.6 "
136-180	32.4 "	27.8 "
180-200	11.1 "	10.5 "
Sum,	<u>76.8</u>	<u>69.0</u>
100-200	100.0	66.6

The point here brought out is that while under the common method the total change appears as something very different from the sum of all its parts, the discrepancy under the method suggested is quite small.

COST STATISTICS OF PUBLIC ELECTRIC LIGHTING.

BY VICTOR ROSEWATER,
SCHOOL OF POLITICAL SCIENCE, COLUMBIA COLLEGE.

Among the various papers published upon the subject of municipal control of public electric lighting the showing made by the statistics of cost is always an important factor. - Whatever be the point of view of the writers, they seem to present their own figures and yet to arrive at essentially inconsistent results. What I propose to do here, then, is simply to touch upon a few of the limitations which must be borne in mind by anyone who wishes to give these statistics their due scientific weight.

I. CONTRACT PRICES.

What is the cost of an electric street-lamp to a city? The answer naturally suggesting itself would be that it is the contract price paid to the lighting corporation. If we have this sum, then we can compare the prices paid in different cities and judge whether the one is being more imposed upon by a so-called relentless monopoly than the other. This is evidently the idea that controlled the officials of the Eleventh Census when they compiled the materials for Census Bulletin No. 100. In that document they present the number of electric street-lamps employed in fifty different cities, the annual cost of each lamp, and the ratio of cost to each head of population. No extended consideration is needed to learn that these figures are absolutely without significance. The fatal defect lies in the fact that they do not show the amount of lighting service. In one place the lamps may burn but five hours nightly for only twenty nights in the month; in another they may be operated all of every night. Even overlooking minor omissions, which will be pointed out in a

moment, any comparison of absolute contract prices is fallacious at the outset. In this respect the Census Bulletin is not the only transgressor; of the many tables illustrating this point, which are found in popular discussions, those that have escaped this initial stumbling-block may be counted without great difficulty.

Leaving aside the Census Bulletin, we may, nevertheless, still find an authoritative presentation of contract prices of public electric lighting that does not have its chief merit in giving too little information. I refer to a report of the Engineer Commissioner of the District of Columbia,¹ from which Table I has been extracted.

Here, notwithstanding the fact that only those cities have been selected in which the lamps burn a period popularly known as "all of every night," the actual period of illumination is given in each instance. We also have data upon several collateral points. Important among these are the terms of the contracts in force. In these cities they vary from monthly renewals to a duration of ten years. The bearing of this point upon the question of price is this: If a city advertises at the same time for bids for lighting under contracts for one, three, five, or ten years, respectively, it will be found that the proposals for different terms will vary materially. The difference between a certainty of work and an uncertainty of work will be calculated on a money basis by the contractor, and will find assertion in the prices offered. To compare the cost of an electric lamp supplied under a ten-year contract with that of one supplied under monthly agreements cannot be strictly accurate.

Again, the location of the wires may be a factor influencing the cost of street illumination to a city, in which the municipal authorities compel the franchised corporations to place their wires under ground. What they in fact do is to compel an increased capitalization of the private company in order to meet the extraordinary expenditure. The larger

¹ 51st Cong., 2nd Sess., Senate Misc. Doc. No. 56.

TABLE I. ARC LAMPS OF 2000 NOMINAL CANDLE-POWER, DECEMBER, 1900.

Cities.	Number of Arc Lamps.	Contract Price per Lamp per Year.	Nightly Period of Illumination.	Term of Contract.	Location of Wires.
New York.....	883	\$123.73*	Sunset to sunrise.....	Annual.....	A few under ground.
Chicago.....	112	175.00	Dusk to daylight.....	Annual.....	Overhead.
Philadelphia.....	1,283	174.29*	Sunset to sunrise.....	Annual.....	" and under ground.
Brooklyn.....	1,528	182.50	30 minutes after sundown to 30 minutes before sunrise.	"	"
St. Louis.....	1,822	74.96	30 minutes after sundown to 45 minutes before sunrise.	Ten years.....	"
Boston.....	1,125	146.00	Sunset to sunrise.....	"	"
Baltimore.....	655	127.75	Sunset to break of day.....	Five years.....	"
Cincinnati.....	27	144.00	All of every night.....	Monthly.....	"
Cleveland.....	106	138.12	" " " "	Annual.....	"
Cleveland.....	1,455	146.00	" " " "	"	" and under ground.
New Orleans.....	1,013	194.76*	Sunset to sunrise.....	Five years.....	"
Pittsburgh.....	920	100.00	Dusk to daylight.....	Three years.....	"
Detroit.....	827	140.05	30 minutes after sunset to 30 minutes before sunrise.	" "	One half mile under ground.
Milwaukee.....	417	112.50	Sunset to sunrise.....	One year.....	Over head and under ground.
Newark.....	420	146.00	All of every night.....	Five years.....	"
Jersey City.....	87	85.82	Sunset to sunrise.....	Annual.....	"
Louisville.....	6	127.75	All of every night.....	"	"
Omaha.....	117	175.00	" " " "	Five years.....	"
Rochester.....	1,142	102.20	Sunset to sunrise.....	Two to five years.....	"
Kansas City.....	125	200.75	All of every night.....	"	"
Providence.....	650	160.60	30 minutes after sundown to 30 minutes before sunrise.	Five years.....	"
Indianapolis.....	112	62.25*	All of every night.....	Annual.....	"
Denver.....	221	198.90*	" " " "	Five years.....	"
Allegheny.....	16	180.00	Dusk to daylight.....	Annual.....	"
Average of 24 cities	625.3	140.00	.....	.....	.....
Washington.....	206	219.00	Sunset to sunrise.....	Annual.....	All under ground.

* Average.

capitalization — in this instance actual and legitimate — can scarcely fail to register an influence upon the price of the product. Those cities in which the wires are in part under ground are undoubtedly expending more for their street illumination than they would otherwise be paying. An illustration may be drawn from the condition of affairs in New York City. The lighting is here distributed without competition among the six companies, which have divided the field with one another. Those located in the business districts secure a slight differential on account of the under ground wiring. In any precise comparison of cost statistics, differences in the location of wires ought to be given a qualified consideration.

Analogous to the distinction just noted are the differences founded in the location of the lamps. These differences take on three distinct forms with reference to the system of hanging, with reference to the number of lamps, and with reference to the relative profitableness of the district.

First, the lamps may be erected upon towers, upon poles, or at street intersections. These different systems necessitate a different expenditure for the particular lighting apparatus. The towers are often quite expensively built. Unlike poles, they are with difficulty removed from one place, where they are no longer wanted, to a place where they are demanded. The poles and gearing for intersection lamps, on the other hand, are comparatively inexpensive.

Second, the lamps may be supplied in clusters or distributed singly. When placed upon towers the usual custom is to bunch a considerable number of lights. The new lamps on Fifth Avenue in New York are erected two on each pole. Most commonly, however, the lamps, when placed upon poles or hung at street intersections, are supplied singly only. Differences in this particular result in differences in the labor service needed. To renew the carbons in two lamps upon one pole requires less than twice the labor of renewing them in two lamps on different poles. The frequency of the lights

has a bearing of a similar character. It is less laborious to attend to many lamps in a small area than to fewer lamps scattered over a wide area.

Third, a private company will be influenced in making bids for public street lighting by the profitableness of the district to be lighted. The business of supplying electric lighting is acknowledged to be one which follows the economic law of increasing returns. Sir John Pender, in his report as president to the directors of the Metropolitan Electrical Supply Company, Limited, of London, said, about a year and a half ago: "Our working expenses in the past, and even at present, are, with few exceptions, the same to all intents and purposes as they will be when we are giving our present maximum supply of 114,000 lights. When I state to you that we have made a small profit on the out-turn of 30,000 lights, it does not require a great amount of imagination to see that it must be a very good business if we can conduct 114,000 lights with a comparatively small increase of expenses." An equally apt illustration of this point appeared recently in New York City in connection with the annual reletting of lighting contracts. The bid of the United States Electric Light Company was for 50 cents a night per light for 17 lamps, and 40 cents a night for 351 lamps. The increase of ten cents a night was demanded in those streets only where no other business outside of the public lighting could be secured. In this case the difference in conditions was reduced to a money measurement,—\$36.50 per lamp per year. A factor of such dimensions ought not to be lost sight of in making systematic comparisons.

II. COST UNDER MUNICIPAL OWNERSHIP.

If we turn now to the cost statistics of electric lighting under municipal ownership of the plant, we strike a set of complications no less serious. At the very beginning of every such investigation we find ourselves in the chaos of American municipal book-keeping. When no two cities employ

the same system of accounts, when in the same city the reports of different departments furnish irreconcilable data, the statistician must seek to extricate himself as best he can. It would scarcely be stating the case too strongly if we should say that out of the probable 150 municipalities owning their own electric lighting plants not five could present an intelligible showing of their operations for the period of one year. The blame for this does not attach entirely to the city officials, for conditions exist in many localities which render a clear financial account a thing next to impossibility. As an example of a concise and commendable statement of the workings of a municipal plant, I cite that relating to Topeka, lately communicated by Mr. Lewis Kingman to the American Society of Civil Engineers, and given as Table No. II.

The special difficulties arising in this connection are of a two-fold character,—those relating to the cost of the installation, and those relating to the annual operating expenses. In most instances the bonded indebtedness incurred for the particular purpose does not cover the entire capital outlay. To add in the proper amount of interest charges requires, then, an assumed capitalization. Where the plant is conducted in conjunction with other monopolies of service, with the water-works, for example, we have a system of joint production, which defies a statistical separation of expenditures. The same obstacle presents itself in relation to the operating expenses. The superintendent may devote only a portion of his time to electric lighting; the line men may attend to the fire-alarm telegraph; the engineers and firemen may be employed at the same time in more than one department. Again, the geographical situation has much to do with determining the cost of the motive power, whether or not water power may be used, or, if steam, the quantity and quality of the fuel. Still another bone of contention lies in the percentage of depreciation to be added to the expense account. This must at all events be an assumed calculation. In Table No. III, prepared by the Electrical Commission of

TABLE II.

Year and Month.	Nights Run During Month.	Hours Run During Month.	Cost on No. of Ho ^{rs} at Cent.	Total Cost. Entire Ex- pense per Month.	Cost per Lamp per Month.	Cost per Lamp per 100 Hours.
1889. Nov.....	28	340.03	7.24	\$1,517.71	\$8.25	\$2.43
Dec.....	29	373.47	7.24	1,775.88	9.65	2.59
1890. Jan.....	29	357.40	7.24	1,694.27	9.21	2.58
Feb.....	26	298.73	7.24	1,632.83	8.88	2.97
March.....	27	274.83	7.24	1,603.80	8.71	3.17
April.....	30	265.42	7.24	1,514.13	8.23	3.11
May.....	28	171.92	7.24	1,319.32	7.17	4.17
June.....	27	132.91	7.24	1,188.69	6.46	4.86
July.....	28	146.34	7.24	1,296.29	7.04	4.82
August.....	28	182.50	7.24	1,323.10	7.19	3.94
Sept.....	27	211.69	7.24	1,391.38	7.56	3.56
Oct.....	25	204.04	7.24	1,311.96	7.13	3.50
Nov.....	24	206.00	7.24	1,419.85	7.72	3.75
Dec.....	25	198.25	7.24	1,396.59	7.59	3.83
1891. Jan.....	24	189.17	7.24	1,417.53	7.70	4.07
Feb.....	21	157.50	7.24	1,371.64	7.46	4.75
March.....	23	158.50	7.24	1,335.82	7.26	4.60
April.....	21	141.83	7.24	1,280.90	6.96	4.90
May.....	23	127.05	7.24	1,272.78	6.92	5.45
June.....	23	118.08	7.24	1,229.60	6.68	5.66
July.....	27	138.75	7.24	1,183.84	6.43	4.63
August.....	28	172.05	7.24	1,266.54	6.88	4.00
Sept.....	30	251.05	7.24	1,437.05	7.81	3.11
Oct.....	16	140.75	7.24	1,940.24	10.59	7.51
Nov.....	28	244.41	7.24	1,477.99	8.03	3.29
Dec.....	27	227.50	7.24	1,432.19	7.78	3.43
Totals.....	672	5,430.17	Av. 8.24	\$37,036.52	Av., \$7.74	Av., \$3.71
Per cent of total expense.....			9.46	100.00		

The plant consists of a building and a line of poles. There are six circuits, with 24.72 miles of line between every other intersection, making them 1100 feet apart. The lamps are dynamos of 30-lamp power each. The connections between two 40-foot poles, one lamp to each pole, showed a pressure of 23.15 volts and a current of 19.0 amperes, 439.85 watts, or 1963 nominal c

TABLE III.

EXPENSES OF MUNICIPAL PLANTS.

ARC LAMPS.

City.	Total Cost of Plant, Including Buildings.	Interest and Depreciation at 16 per cent.	Taxes and Insurance.	Superintendence and Labor.	Fuel.			Carbona.	Repairs.	Sundries.	Total.
					Kind.	Price per ton, cord, etc.	Cost.				
Aberdeen, Miss.	\$10,000.00	\$1,600.00	None given.	\$1,320.00	Coal.....	\$2.75	\$750.00	\$127.75	\$100.00	\$50.00	\$3,047.75
Aurora, Ill.	18,831.56	3,013.05	\$500.00	2,689.74	Soft coal.	1.80	2,382.50	(*)	723.24	47.03	9,156.46
Bangor, Me.	34,141.01	5,462.56	None.	3,680.03	Water Power.			503.00	(†)	1,228.00	10,874.19
Bay City, Mich.	30,000.00	4,800.00	None.	4,220.00	Shavings.....		1,429.79	518.34	(†)	353.05	11,452.90
Bloomington, Ill.	75,000.00	12,000.00	420.75	6,112.32	Coal.....	1.75	2,615.00	1,060.00	(†)	4,753.68	26,961.75
Denver, Mass.	15,579.09	2,492.65	112.50	1,540.00	Coal.....		557.09	258.40	(†)	362.80	5,323.44
Dunkirk, N. Y.	13,338.71	2,134.19	None given.	680.00	Coal.....		1,190.07	533.00	160.35	443.96	4,921.57
Fairfield, Iowa.	5,000.00	800.00	None.	240.00	Coal.....	23.75	283.38	20.00	93.89	(†)	1,044.13
Gothen, Ind.	9,000.00	1,440.00	None.	860.00	Oil.....		804.00	120.00	100.00	280.07	3,424.00
Lyons, Iowa.	17,250.00	2,776.00	None.	1,825.81	Pine strips.....	0.90	900.00	243.71	440.63	(†)	6,196.22
Meadville, Pa.	20,000.00	3,200.00	56.00	2,280.00	Gas.....		400.00	306.00	(†)	1,000.00	7,332.00
Ottawa, Ill.	16,000.00	2,560.00	25.00	2,290.00	Included in preceding.			700.00	400.00	(†)	6,905.00
Paris, Ill.	10,500.00	1,680.00	None.	120.00	Coal.....	1.75	720.00	175.00	100.00	100.00	2,805.00
St. Joseph, Mo.	62,000.00	9,920.00	150.00	6,910.00	Coal.....	1.65	3,697.25	1,067.86	201.61	1,170.00	23,106.72
Sharpsburg, Pa.	5,725.76	916.12	None.	720.00	Gas.....		480.00	153.00	120.00	(§)	2,389.12
Sherman, Tex.	10,000.00	1,600.00	None.	1,800.00	Coal.....	4.00	750.00	120.00	25.00	25.00	4,320.00
Topeka, Kans.	52,000.00	8,320.00	300.00	5,360.00	Coal.....	3.05	3,660.00	750.00	1,200.00	285.00	19,825.00
Xenia, Ohio.	18,500.00	2,950.00	20.00	1,800.00	Coal.....	2.20	1,525.00	350.00	250.00	850.00	7,755.00

† Included in fuel.
‡ Included elsewhere.
§ Included in repairs.

* Included in fuel.

† Included in sundries.

‡ Included elsewhere.

§ Included in repairs.

ARC AND INCANDESCENT.

City.	Total Cost of Plant, Including Buildings.	Interest and Depreciation at 16 per cent.	Taxes and Insurance.	Superintendence and Labor.	Yearly Expenses.				Repairs.	Sundries.	Total.			
					Kind.	Price per ton, cord, etc.	Fuel.	Coal.						
Allegheny, Pa.	\$175,000.00	28,000.00	\$500.00	\$25,000.00	Coal.....	\$1.05	\$8,000.00	\$4,250.00	\$3,500.00	\$2,250.00	\$71,500.00			
Brainerd, Minn.	40,000.00	6,400.00	40.00	2,900.00	Coal and oil.....		2,180.86	250.00	200.00	50.00	9,340.00			
Canton, Ohio.	26,301.35	4,304.22	None.	1,641.50	{ Slack coal.....	3.50								
Galveston, Tex.	39,990.00	6,398.40	None.	7,171.67	{ Coal.....	5.19	7,615.58	1,800.00	1,200.00	211.15	24,426.80			
Herrington, Kans.	30,000.00	4,800.00	None.	1,980.00	Coal.....	2.43	2,400.00	300.00	275.00	100.00	9,855.00			
Statesville, N. C.	8,500.00	1,360.00	None.	1,200.00	Wood.....	3.60	750.00	145.00	35.00	50.00	3,682.00			
Waukegan, Wash.	17,000.00	2,720.00	None given.	3,612.00	Wood.....		600.00	300.00	150.00	350.00	7,822.00			

INCANDERENT.											
Charlton, Iowa.	\$24,600.00	\$3,936.00	\$50.00	\$2,080.00	Slack coal.....	\$0.50	\$1,500.00	(t)	\$125.00	(t)	\$7,691.00
Falls City, Neb.	9,000.00	1,440.00	None.	2,050.00	Coal.....	2.65	(s)	500.00	(s)	(s)	3,480.00
Freemont, Neb.	7,000.00	1,120.00	None. 30.	1,000.00	Coal.....	3.25	300.00	60.00	40.00	10.00	2,560.00

INCANDESCENT.

Charlton, Iowa.....	\$24,600.00	\$3,936.00	\$50.00	\$2,060.00	Slack coal.....	\$0.50	\$1,500.00	(†)	\$125.00	(†)
Falla City, Nebr.....	9,000.00	1,440.00	None.	2,050.00	Coal.....	2.65	300.00	(*)	40.00	(*)
Tecumseh, Nebr.....	7,000.00	1,120.00	30.00	1,000.00	Coal.....	3.25	300.00	60.00	40.00	10.00

* Included in superintendence.

† Included elsewhere.

the District of Columbia,¹ it has been placed at 10 per cent of the total investment for both plant and buildings. It seems to me that, even accepting that assumed ratio, the expenditures for current repairs ought to be deducted from the item.

Having thus obtained an approximately accurate expense account, the problem of ascertaining the annual cost per lamp becomes apparently simple. All that is necessary is to divide the total by the number of lamps operated. The results of the Electrical Commission are shown in Table IV.

We have here not only the cost per lamp per year, but also the cost per hour. The cost per hour is utterly worthless for any scientific use. The number of hours of lighting is too fluctuating a figure; the greater the number of hours the less the apparent cost per hour. If variations in the duration of nightly lighting vitiates to a certain extent the cost statistics per lamp per year, the variations in the number of hours take away every vestige of value from the figure representing the cost per hour. Furthermore, many of the limitations noted with respect to contract prices apply equally to the cost under municipal ownership. The municipality is usually circumscribed in its market; it is seldom permitted to sell its product to private consumers. It is likewise subject to the same influences as accrue to private companies from differences in the locations of lamps and wires.

III. GENERAL COMPARISONS.

Our examination of the nature of the statistics at hand being completed, we must next inquire how far these statistics may be used for purposes of general comparison. This question in reality resolves itself into how far we may rely upon a simple average of the results. Can we say that a specific contract price is so much below or so much above the average price paid by American municipalities? Can we say that the cost in a designated city is so much below or so much

¹ 52nd Cong., 1st Sess., House Ex. Doc. No. 15.

TABLE IV. COST PER LAMP UNDER MUNICIPAL OWNERSHIP.

ARC LAMPS.

City.	Number of Lights.	Hours of Lighting.		Cost per Lamp.	
		Per Day.	Per Year.	Per Year.	Per Hour.
Aberdeen, Miss.....	35	8	2,920	\$112.79	\$0.0386
Aurora, Ill.....	83	7h 10m	2,622	110.32	.0421
Bangor, Me.....	146	(*)	3,600	74.48	.0207
Bay City, Mich.....	141	.....	2,221	82.64	.0372
Bloomington, Ill.....	220	.....	2,247	122.55	.0545
Danvers, Mass.....	75	4.847	1,769	70.98	.0401
Dunkirk, N. Y.....	60	10h 51m	4,000	82.03	.0205
Fairfield, Iowa.....	10	3.5	1,278	150.41	.1177
Goshen, Ind.....	31	9.75	3,559	110.45	.0310
Lyons, Iowa.....	59	7	2,555	110.11	.0431
Meadville, Pa.....	70	8	2,920	104.74	.0393
Ottawa, Ill.....	100	.....	3,600	39.05	.0167
Paris, Ill.....	60	(†)	3,000	48.25	.0161
St. Joseph, Mo.....	253	8	2,920	91.33	.0313
Sharpsburg, Pa.....	35	8	2,920	68.26	.0234
Sherman, Tex.....	43	7	2,555	100.47	.0393
Topeka, Kan.....	184	(‡)	3,600	107.74	.0299
Xenia, Ohio.....	80	(†)	3,300	97.74	.0328

* Dark to daylight.

† Moon schedule.

‡ All dark hours.

ARC AND INCANDESCENT.

City.	Number of Lights.	Hours of Lighting.		Gross Cost per Lamp (Arc).		Receipts (from Rented Lamps).	Net Cost per Lamp (Arc).	
		Per Day.	Per Year.	Per Year.	Per Hour.		Per Year.	Per Hour.
Allegheny, Pa.....	Arc..... 422	11	}	\$106.40	.....	None.	.....	.....
	Incandescent.. 2,500	24						
Brainerd, Minn.....	Arc..... 30	} 4.75	.....	71.85	.....	None given.	.....	.....
	Incandescent.. 1,000							
Galion, Ohio.....	Arc..... 71	} 10	.....	73.41	.....	\$2,250.00	\$56.22	.....
	Incandescent.. 600							
Galveston, Tex.....	Arc..... 175	} 9	.....	114.28	.....	None.	.....	.....
	Incandescent.. 300							
Herington, Kan.....	Arc..... 20	} 5	.....	140.79	.....	4,200.00	80.80	.....
	Incandescent.. 500							
Statesville, N. C.....	Arc..... 30	} Dark.	}	70.42	.....	None given.	.....	.....
	Incandescent.. 220							
Vancouver, Wash.....	Arc..... 35	} 12	.....	87.80	.....	None given.	.....	.....
	Incandescent.. 540							

INCANDESCENT.

City.	Number of Lights.	Hours of Lighting.		Gross Cost per Lamp.		Receipts (from Rented Lamps).	Net Cost per Lamp.	
		Per Day.	Per Year.	Per Year.	Per Hour.		Per Year.	Per Hour.
Chariton, Iowa.....	1,300	12	4,380	\$5.92	\$0.00135	Not given.	.....	.....
Falls City, Neb.....	400	4	1,460	8.73	.00599	\$2,085.00	\$3.51	\$0.00240
Topeka, Neb.....	500	5	1,825	5.12	.00281	1,680.00	1.76	.00098

above the average cost of electric lighting under municipal ownership? If we can say so, then why not compare these two averages and thus learn which method of public lighting is less expensive,—that by contract with private parties or that of municipal ownership? All this has been done time and time again,¹ yet I have met but one argument in its support. It is claimed that all a city wants is to have its streets lighted. If it can get along with less illumination than its neighbor, so much to its advantage. If under municipal ownership a city does with less light than under private contract, it simply means that private companies force more light upon the cities under that régime than they require. The average represents annual illumination. Annual illumination is a concrete thing capable of comparison, and therefore a comparison of averages is a comparison of like things.

Such argument, I maintain, is merely specious. The many limitations and differentiating factors, which I have enumerated, preclude any comparison of averages whatever. In this case the average represents nothing. Unlike elements may produce the same cost statistics, and the same cost may represent totally different conditions. If the defective factors were in both instances the same, they might possibly be eliminated by combination and permit of a general use. Here this is not the case. The average is fictitious through and through.

It has sometimes been attempted to compare the cost of electric lighting in the same city under contract with private companies and under municipal ownership. Figures of this kind are valid so far as they go. But even where the city changes from one régime to another, by buying out the private corporation, or by constructing its own plant, we can never be certain that the conditions remain unchanged, that we are comparing similar services. Mr. R. J. Finley has, in

¹ I confess to have made this mistake once in my first essay on this subject, published in the *Independent*, March, 1889. The same error is found in Mr. Francisco's *Municipal Lighting*, in the report of the Engineer Commissioner cited, and in Mr. Finley's article in the *Review of Reviews*, February, 1893; also in the *Census Bulletin*, and others.

a recent magazine article, adopted still a different procedure. He has compiled two tables representing the two systems, each table showing the cost of lighting in a number of cities specially chosen with reference to geographical situation and industrial conditions, in order to counterbalance the one against the other. The plan is ingenious. Sufficient data are given to convey a comprehensive idea of the situation, but Mr. Finley also gives way to the irresistible impulse to generalize with an average. His average, like the others, is misleading and meaningless.

If this review of the cost statistics of public electric lighting can serve any useful purpose, it must be to emphasize the fact that in such matters simplicity is deception. It is useless to seek to represent a complicated process by a single numerical figure. The statistics themselves are valuable, but must be employed as bases of comparison only with the utmost care, and with due allowance for the many limitations which affect their accuracy.

VICTOR ROSEWATER.

IMMIGRATION AND THE FOREIGN BORN POPULATION.

BY PROF. RICHMOND MAYO-SMITH.

The population of the United States from 1880 to 1890 increased 24.86 per cent. The foreign born element of the population increased during that period 38.47 per cent. The increase of this latter element goes on under peculiar conditions. It is not the natural increase of the foreign born who were here in 1880. On the contrary, the natural increase of the foreign born goes to swell the number of the native born. Neither is it the natural increase of the immigrants who came here during the period 1880 to 1890. Their natural increase goes also to swell the number of the native born. The increase is due entirely to immigration. Still further, this immigration must be sufficiently strong to overcome the decrease among the foreign born by all the deaths during the decade, the decrease among the immigrants by death after their arrival, and the loss by emigration. We have therefore in this case a very peculiar problem. That the increase has been so large shows an enormous immigration, or, on the other hand, a very slight diminution by deaths and by emigration. It is a matter of considerable interest to determine the relative value of these three factors, viz., the strength of immigration, the loss by emigration, *i. e.*, the return of immigrants to their old home, and the decrease by deaths.

The elements in this problem are some of them known and some of them unknown. We know of course the number of the foreign born in 1880 and 1890. We know still further the immigration for each year during the decade. The points to be determined are the emigration from this country, and the death rate among the foreign born and the immigrants.

The object of the following paper is to inquire whether these last two figures can be determined with any degree of approximation. It would be extremely interesting to know accurately both facts, viz., the number of immigrants who, instead of remaining in this country, decide to return home; and the mortality rate among these new citizens. The first fact is necessary in order to judge of the influence of immigration upon the growth of population in the United States. The second fact would throw light on the question of the relative increase of foreigners and natives in this country, and especially whether the foreigners are crowding the natives out. It would also have a sociological interest in determining the effect of change of environment upon different nationalities.

The statistical data for the solution of this problem seem to be the following:—

In 1880 the number of the foreign born in the United States was 6,679,943. During the decade 1880 to 1890 the number of immigrants to the United States was 5,246,613. The two together make 11,926,556. This represents the number of foreign born persons who should have been here in 1890 if there had been no emigration and no deaths. The Eleventh Census gives the actual number of foreign born here in 1890 as 9,249,547. This leaves us with 2,677,009 to account for by emigration and by deaths.

Let us take up first the question of emigration. We have no official statistics of the number of emigrants leaving the United States. The Bureau of Statistics of the Treasury Department is accustomed to print in the annual Reports on Commerce and Navigation of the United States an estimate, made on the basis of returns from the principal shipping lines, of the number of passengers departing from the United States. Among these it is impossible to distinguish United States citizens going abroad, foreigners who have simply been travelling in this country and who are returning home, and emigrants who are leaving this country permanently. It is evident, however, that if for a series of years we take the

total number of passengers arriving in this country and deduct the total number of passengers departing from it we shall get at approximately the net immigration, *i. e.*, the number of foreigners who come and remain here. For the United States citizens who are among the passengers departing sooner or later reappear among the passengers arriving in this country. So also the travellers from foreign countries, who figure among the passengers arriving in the United States, upon their return figure among the passengers departing from the United States. Such a series of figures would not give us the net immigration for any single year, but for a considerable period of time the result would be correct.

On this basis the net immigration to the United States for the decade 1880 to 1890 is shown in the following table:—

TABLE SHOWING THE TOTAL NUMBER OF PASSENGERS DEPARTING FROM, AND THE TOTAL NUMBER OF PASSENGERS ARRIVING IN, THE UNITED STATES FOR EACH YEAR ENDING JUNE 30, 1881, TO 1890.

Year Ending June 30.	Passengers Arriving.	Passengers Departing.	Net Immigration.
1881	743,712	112,072	631,640
1882	869,144	133,496	735,648
1883	712,515	157,954	554,561
1884	649,491	187,706	461,785
1885	535,009	243,890	291,119
1886	444,303	201,293	243,010
1887	606,385	193,897	411,488
1888	663,039	211,212	451,827
1889	546,513	239,557	306,956
1890	564,442	238,139	326,303
Total.....	.....	.....	4,414,337

According to this estimate the total net immigration to the United States during the ten years was 4,414,337. The total gross immigration having been 5,246,613 the net loss by emigration seems to have been 832,276. This would seem to show that 15.86 per cent of the total number of immigrants to this country sooner or later return home. It is evident,

however, from observation, that the tendency to emigrate varies with different nationalities. Our returns of passengers departing do not distinguish the nationality of the passengers, so that we shall have to content ourselves with this general figure without going into details.

Such being the fact in regard to loss by emigration we turn to the second question of the probable loss by deaths. This is an even more difficult question.

Our vital statistics for the United States are not very trustworthy. Dr. Billings, in his investigation of 1880, made out a death rate for the United States of 15 pro mille. By comparison with the registration in certain states he was led to believe that there was a deficiency in the number of deaths reported varying from 15 to 30 per cent. In view of this comparison, he was led to raise the death rate 20 per cent, making it 18 pro mille for the whole population. We do not know now whether the mortality among the foreign born is the same as that among the whole population or not. But even were the mortality the same the death rate would not be the same, for the foreign born have a much more favorable distribution by age than the whole population. On the basis of the death rate for the whole population by age classes given in Vol. xi, page xxv, of the Tenth Census, and the distribution of native and foreign born persons in age classes given in Vol. xii, page ciii, of the Tenth Census, I have calculated that if the mortality be the same among the foreign born as among the whole population the foreign born have a death rate of 13.44. Raise this by 20 per cent, as Dr. Billings has done for the general death rate, and we have a death rate for the foreign born of 16.12 pro mille.

We must consider still further the death rate among the immigrants after their arrival here. They have a different and even more favorable age distribution than the foreign born. Proceeding by the same method as before, I calculate that if the immigrants, after their arrival in this country, have the same mortality as the whole population the death

rate among them will be 11.6. Raise this by 20 per cent, as before, and we have a death rate for the immigrants of 13.92 pro mille. Taking the average between the death rates of the foreign born and of the immigrants we have a death rate for the two classes of about 15 pro mille.

Some objection may be raised to this calculation on the ground that the foreign born population which started in 1880 with the death rate of about 16 would be constantly increasing in age, so that its death rate should be constantly increasing. To offset this it may be said that even after ten years the greater part of this population (65 per cent) would still be under the age where the mortality approaches 16 pro mille. Still further, that the younger part of this population would be constantly approaching an age where the mortality was less. The same fact would be true of the immigrants. While we allow them a death rate of 15 pro mille, the majority of them, during the whole period after their arrival, would be of an age (say from 15 to 30) where the death rate is very much less.

On the basis of this net immigration, and with a probable death rate of 15 pro mille, I have made the following calculation: Starting with the foreign born population of the United States in June, 1880, I have allowed a death rate of 15 pro mille, and at the end of the year have added the immigration of the year ending June 30, 1881. With this population I have continued, allowing a death rate of 15 pro mille, and adding at the end of the year the immigration for the year ending June 30, 1882. Continuing this process the survivors of the foreign born and of the immigrants should have been in 1890 9,825,727. This still leaves a deficiency of 576,180. There should be added to this deficiency the immigration overland, which does not enter into the returns of our Treasury Department after July 1, 1885. From the reports of the Minister of Agriculture of Canada we learn that during the period from July 1, 1885, to July 1, 1890, there passed through Canada, en route for the United States, not less than 379,942

immigrants; allowing for these a death rate of 15 pro mille, the survivors in 1890 would number 368,186. These must be added to the former number, making a total deficiency of 944,366.

How shall we account for this great deficiency? It may be due to one or all of four causes. It may be that the death rate among the foreign born is greater than 15 pro mille. It may be that the emigration is greater than that which we have allowed for. It is barely possible that some of the foreign born persons may have declared themselves in the Census to have been native born. Or, finally, the enumeration of the foreign born, at the Eleventh Census, may have been defective. In regard to the last two causes I do not know that we have any evidence accessible to prove or to disprove them. It will repay us to examine a little more closely the first two.

In regard to the probable death rate we may extend the inquiry in the following direction: In Bulletin No. 357 of the Eleventh Census we have the foreign born by nationalities in 1880 and 1890. From the reports of the Treasury Department Bureau of Statistics we have the gross immigration for each year by nationalities. If now we can find a nationality where there is not much probability of emigration or of defective enumeration, we shall be able to calculate the loss by death during the ten years. We seem to have such a case in the Russian and Polish Jews. These persons driven from Russia by persecution have no inducement to return; hence, probably all that have ever come to this country are either here now or have died here. Still further, owing to peculiarities of race and language it is not probable that the Census has returned them either as native born or as belonging to some other nationality. Here, therefore, we have a case where we can test our assumed death rate.

In 1880 the number of Russians and Poles in this country was 84,279; during the ten years from 1880 to 1890 the number of immigrants from Russia and Poland was 265,088. The

two together make 349,367. The number of Russians and Poles in the Eleventh Census was 330,084. This shows the extraordinarily small deficiency of 19,283. We find now by calculation that a death rate of only 11 pro mille will account for this deficiency. In this case, therefore, we have a much lower death rate among the foreign born after their arrival in this country than among the other classes of the population. It is also to be noticed that among the Russian and Polish Jews there is a larger proportion of children (26.2 per cent instead of 20.9 per cent) than is usual among immigrants, owing to the fact that persecution drives whole families abroad. It must also be noticed that these Jews belong very largely to the poorest and most destitute classes, that they are crowded together in the tenement houses of large cities, that they are subject to excessive hours of labor, and that their sanitary condition is such as to bring about a high death rate rather than a low one. On the other hand, it is true that the Jews generally have a low mortality rate. Dr. Billings, in his special investigation of 16,000 Jewish families in this country, found a death rate of only 7.1 pro mille; and in 1889 the highest death rate he allowed was less than 10 pro mille. But even taking this fact into consideration the indication seems to be that the death rate of 15 pro mille, which we have allowed for the immigrants, is sufficiently large.

We have no other nationality which gives us so satisfactory a result as the one just mentioned, because in no other case can we assert that there is little or no emigration. An almost parallel case would seem to be that of the Norwegians and Swedes. They are a sturdy race who settle very largely on farms in the West, and their death rate would probably be low. I have no means of ascertaining whether the Norwegians and Swedes are inclined to return home, but I judge that this emigration cannot be very large. For these immigrants we have the following figures:—

Norwegians and Swedes here in 1880,	376,066
Norwegians and Swedes immigrants, 1880 to 1890, . . .	568,362
Total,	944,428
Norwegians and Swedes here in 1890,	800,706
Deficiency,	143,722

If we allow a death rate of 15 pro mille during the period 1880 to 1890, the survivors in 1890 should have been 851,407. This leaves still a deficiency of 50,701, or 8.92 per cent, of the immigration of the decade to be attributed to emigration. This does not seem to be excessive. Allowing a death rate of 20 pro mille, the survivors in 1890 would have been 822,686, leaving a deficiency of 21,980, or 3.86 per cent, of the immigration.

There is one other nationality about which we have some special information. The British Board of Trade gives both the emigration and the immigration of persons of British and Irish origin. From this we can ascertain the net emigration to the United States of persons of British and Irish origin. This number would not be exact for any single year, but for a series of years it would give the net emigration. For the ten calendar years, 1881 to 1890, this net emigration amounted to 1,168,516. According to the United States statistics the number of immigrants of British and Irish origin was 1,462,839. This would seem to indicate a return movement of British and Irish from the United States of 294,323, or 20.4 per cent of the gross immigration, which does not seem excessive. Taking, now, this net immigration we have the following calculation: —

British and Irish foreign born in United States, 1880, . . .	2,772,169
British and Irish immigration, net,	1,168,516
Total,	3,940,685
Total British and Irish foreign born, 1890,	3,122,911
Deficiency,	817,774

This deficiency represents death among the foreign born of 1880 and the immigrants, during the ten years. But in order to account for this deficiency we require a very large death rate, as follows: —

Death Rate.	Number in 1890 should have been	Deficiency.
With death rate 15 pro mille.....	3,469,650	346,739
" " " 20 " "	3,325,502	202,591
" " " 25 " "	3,187,379	64,468
" " " 30 " "	3,055,041	(Surplus) 67,870

With a death rate of 15 pro mille we have therefore a deficiency of 346,739, even taking only the net immigration.

It will be interesting to continue our inquiry to the other nationalities of which we have the record. We will present for each nationality a little table giving the foreign born of 1880, the immigration during the ten years, the foreign born of 1890, the deficiency, the number of survivors, allowing a death rate of 15 pro mille, and the deficiency after allowing such death rate.

GERMANY.

German born (United States, 1880),	1,966,742
German immigration, 1880 to 1890 (gross),	1,452,970
Total,	3,419,712
German born, 1890,	2,784,894
Deficiency,	634,818

Death Rate.	Survivors in 1890.	Deficiency.	Per Cent of Immigration.
Death rate 15 pro mille.....	3,029,887	244,963	16.86
" " 20 " "	2,910,215	125,321	8.62
" " 25 " "	2,795,362	10,468	.....

In the case of Germany, with a death rate of 15 pro mille, we have only a moderate deficiency, which can easily be accounted for by a return movement of less than 17 per cent of the immigration. Such a return movement does not seem at all unreasonable, so that in this case we should say that the statistics were probably correct. It is to be observed that this return movement is less than the return movement of the British and Irish, which we discovered by comparing the British and American statistics. With a death rate of 20

pro mille (which is possible, as the German immigration is much of it of old date) the return movement is represented by only 8.62 per cent.

DENMARK.

Foreign born in United States, 1880 (Denmark),	64,196
Danish immigration, 1880 to 1890,	88,132
Total,	152,328
Foreign born in United States (Denmark),	132,543
Deficiency,	19,785

Death Rate.	Survivors in 1890.	Deficiency.	Per Cent of Immigration.
Death rate 15 pro mille.....	137,419	4,876	5.53
Death rate 20 pro mille.....	132,821	278	....

The Danish statistics are evidently very near the truth, for the slight deficiency of 5.53 per cent may be easily attributed to emigration.

The countries thus far treated have given us but little difficulty. The other nationalities show a much larger deficiency.

AUSTRIA, INCLUDING BOHEMIA.

Austrian foreign born in United States, 1880,	124,024
Austrian immigration, 1880 to 1890,	226,038
Total,	350,062
Austrian foreign born in United States, 1890,	241,377
Deficiency,	108,685

Death Rate.	Survivors in 1890.	Deficiency.	Per Cent of Immigration.
Death rate 15 pro mille.....	319,582	78,155	34.57
Death rate 20 pro mille.....	310,089	68,712	30.40

It is evidently useless to continue this table any further, for it would require an altogether impossible death rate to account for the deficiency. With the ordinary death rate of 15 pro mille there would seem to be a return movement of over one-third of the Austrian-Bohemian immigration. This seems to me very large.

HUNGARY.

Foreign born (Hungary) in United States, 1880,	11,526
Immigration (Hungary), 1880 to 1890,	127,681
Total,	139,207
Foreign born (Hungary) in United States, 1890,	62,435
Deficiency,	76,772

Death Rate.	Survivors in 1890.	Deficiency.	Per Cent of Immigration.
Death rate 15 pro mille.....	130,568	68,133	53.36
Death rate 20 pro mille.....	127,848	65,413	51.23

In the case of Hungary, even allowing a death rate of 20 pro mille, there is still a very large deficiency. This would indicate an enormous migratory movement on the part of these people, corresponding perhaps to the general impression that a good many Hungarians come here to stay a short time with the intention of returning home.

ITALY.

Foreign born in United States, 1880,	44,230
Immigration (Italian), 1880 to 1890,	307,309
Total,	351,539
Foreign born (Italy) in United States, 1890,	182,580
Deficiency,	168,959

Death Rate.	Survivors in 1890.	Deficiency.	Per Cent of Immigration.
Death rate 15 pro mille.....	328,820	146,240	47.58
Death rate 20 pro mille.....	321,695	139,115	45.26

In the case of Italy, also, even with a death rate of 20 pro mille, we have a very considerable deficiency. It is the common impression, however, that a great many Italians return home. This is partly confirmed by the Italian statistics, which give the number of Italians returning to Italy, third class, from the United States, as 4734 in 1889, 2859 in 1890, and 10,265 in 1891. These statistics have been collected only during the last three years, and it seems possible that the figures for 1891 may be nearer the truth than those for the preceding years.

FRANCE.

Foreign born (French) in United States, 1880,	106,071
Immigration, 1880 to 1890,	50,464
Total,	157,435
Foreign born (French) in United States, 1890,	113,174
Deficiency,	44,266

It is evidently useless to calculate the deficiency with any ordinary death rate in the case of the French. The emigration almost equals the immigration, so that the increase of the number of French in the United States is very slow. This has been true ever since 1860. From 1860 to 1870 the increase among the French foreign born was only 6532. From 1870 to 1880 there was an absolute decrease of 9431. From 1880 to 1890 there was an increase of 6203. This corresponds, therefore, to past experience, and seems to confirm the common notion, that the French always desire to return some day to France.

The smaller countries of Europe are not very important in this question, but we will carry out the same calculation for them.

HOLLAND.

Foreign born (Dutch) in United States, 1880,	58,090
Immigration (Dutch), 1880 to 1890,	53,701
Total,	111,791
Foreign born (Dutch) in United States, 1890,	81,828
Deficiency,	29,963

Death Rate.	Survivors in 1890.	Deficiency.	Per Cent of Immigration.
Death rate 15 pro mille.....	99,769	19,041	37.13
Death rate 20 pro mille.....	96,078	14,250	26.53

BELGIUM.

Foreign born in 1880,	15,535
Immigration, 1880-90,	20,177
Total,	35,712
Foreign born, 1890,	22,639
Deficiency,	13,073

Death Rate.	Survivors in 1890.	Deficiency.	Per Cent of Immigration.
With death rate 15 pro mille...	32,411	9,772	48.42
With death rate 20 pro mille...	31,401	8,762	43.42

SWITZERLAND.

Foreign born in 1890.	88,621
Immigration, 1880-90,	81,968
Total,	170,609
Foreign born, 1890,	104,069
Deficiency,	66,540

Death Rate.	Survivors in 1890.	Deficiency.	Per Cent of Immigration.
Death rate 15 pro mille.....	152,169	48,100	58.67
Death rate 20 pro mille.....	146,451	42,382	51.69

In order to judge, now, whether these deficiencies may reasonably be accounted for by a return movement of emigration, I have arranged the following table:—

TABLE SHOWING THE EMIGRATION NECESSARY TO ACCOUNT FOR THE DEFICIENCY IN THE STATISTICS, ALLOWING A DEATH RATE OF 15 PRO MILLE.

Country.	Deficiency.	Percentage of Immigration.	Annual Emigration Necessary.
Russia and Poland.....	None.	None.	None.
Denmark.....	4,876	5.53	487
Norway and Sweden.....	50,701	8.92	5,070
Germany.....	244,993	16.86	24,499
Great Britain and Ireland.....	626,706	42.84	62,670
Austria (including Bohemia).....	78,155	34.57	7,815
Hungary.....	68,133	53.36	6,813
Italy.....	146,240	47.58	14,624
Holland.....	19,941	37.13	1,994
Belgium.....	9,772	48.42	977
Switzerland.....	48,100	58.67	4,810

I have omitted from this table France on account of the peculiar character of French migration. Remembering now that we have ascertained from two other and independent

sources that the return movement of emigration is probably from 16 to 20 per cent of the immigration, and taking into consideration the facts of observation in regard to various nationalities, we ought to be able from this table to form some opinion upon the question of how the deficiency is to be accounted for.

France we omit from consideration, as just said. Belgium, with a deficiency of 48.42 per cent to be accounted for, is very likely in the same position as France.

Russia and Poland, Norway and Sweden, and Denmark present no difficulty, the deficiency being so small.

Germany (deficiency 16.86 per cent), it is reasonable to suppose, is about correct, for a slightly increased death rate and a moderate emigration would account for the deficiency.

Italy (with a very large deficiency, 44.61 per cent) may be accounted for by a large death rate, which is not improbable, considering the habits and condition of Italian immigrants, accompanied by the large emigration which is commonly supposed to exist. It is barely possible that similar causes may be at work among the Austrians and Bohemians, which would account for the large deficiency (34.57 per cent) among them.

Hungary presents so large a deficiency (53.36 per cent) that it seems to me difficult to account for it on the same theory. It is true that there may be a heavy death rate among these people, and it is also commonly supposed that many of them return. It must also be remembered that many of the Hungarians live in remote mining districts, where they might easily have escaped enumeration.

Holland and Switzerland are to me inexplicable.

But the most serious case is that of the British and Irish. Taking only the net immigration there is a deficiency of nearly 30 per cent. Taking the gross immigration, in order to compare them with the other nationalities, there is a deficiency of 42.84 per cent. It must be remembered, too, that this does not include the immigration of British and Irish by

way of Canada, which must be large. There seems to be no reason why we should assign to the British and Irish a larger death rate than 15 pro mille. On the other hand, it seems to me impossible to believe that from 40 to 50 per cent of the British and Irish immigrants are accustomed to return home. Such a movement as that would inevitably have attracted attention. Two other solutions of the difficulty present themselves. One is that the Irish living in the crowded tenement-house district of large cities and in factory towns, where both men and women are absent from home during the day, and many of the British and Welsh being, like the Hungarians in somewhat remote mining districts, the enumeration of these two classes may have presented unusual difficulties. The other consideration is that the British and Irish both speaking English it may have been difficult to distinguish them from the native born. This would have been especially the case in families where some of the children were born before and some after the parents came to this country. It is barely possible, therefore, that a portion of these British and Irish may be found among the native born of foreign parentage.

It is possible to continue the analysis by distinguishing between the Irish, the Scotch, and the English (including the Welsh and British not specified). Following out our old method we have the three following tables:—

IRELAND.

Irish born, here in 1880,	1,854,571
Irish immigration (gross), 1880 to 1890,	655,482
Total,	2,510,053
Irish born, here in 1890,	1,871,509
Deficiency,	638,544

Death Rate.	Survivors in 1890.	Deficiency.	Per Cent of Immigration.
Death rate 15 pro mille.....	2,212,870	341,361	52.07
Death rate 20 pro mille.....	2,112,315	240,806	36.73

ENGLAND (INCLUDING WALES AND GREAT BRITAIN NOT SPECIFIED).

Foreign born in United States, 1880,	747,462
Immigration, 1880 to 1890,	657,488
Total,	1,404,950
Foreign born in 1890,	1,009,171
Deficiency,	395,779

Death Rate.	Survivors in 1890.	Deficiency.	Per Cent of Immigration.
Death rate 15 pro mille.....	1,257,303	248,132	37.73
Death rate 25 pro mille.....	1,211,904	202,733	30.83

SCOTLAND.

Foreign born in United States in 1880,	170,136
Immigration, 1880 to 1890,	149,869
Total,	320,005
Foreign born in 1890,	242,231
Deficiency,	77,774

Death Rate.	Survivors in 1890.	Deficiency.	Per Cent of Immigration.
Death rate 15 pro mille.....	286,864	44,633	29.78
Death rate 20 pro mille.....	276,671	34,440	22.98

It seems from this calculation that, allowing a death rate of 15 pro mille, we have in the case of the Irish a deficiency of 52.07 per cent, of the English and Welsh 37.73 per cent, and of the Scotch of 29.78 per cent. In the case of both the English and Scotch the deficiency is very large, but may be partly explained by the migratory habits of these people, who may very likely, after coming to the United States, pass into Canada or to Australia. In the case of the Irish the deficiency is astonishing, and brings about the result that, notwithstanding an immigration of 655,482 during the decade, the Irish born population of the United States increased less than 1 per cent. In view of the fact that the population of Ireland is constantly decreasing, it seems to me impossible to believe that anything like this number of Irish return to their former home. This deficiency, therefore, can only be explained by the suggestions mentioned above.

If we allow a greater death rate, say 20 pro mille, the

deficiency in most of the countries is still very large, as is shown by the following table:—

TABLE SHOWING THE EMIGRATION NECESSARY TO ACCOUNT FOR THE DEFICIENCY IN THE STATISTICS, ALLOWING A DEATH RATE OF 20 PER MILLE.

Country.	Deficiency.	Percentage of Immigration.	Annual Emigration Necessary.
Russia and Poland.....	None.	None.	None.
Denmark.....	None.	None.	None.
Norway and Sweden.....	21,980	3.86	2,198
Germany.....	125,321	8.62	12,532
Great Britain and Ireland.....	477,988	32.67	47,798
England and Wales.....	202,733	30.83	20,273
Scotland.....	34,440	22.98	3,444
Ireland.....	240,806	36.73	24,080
Austria (including Bohemia).....	68,712	30.40	6,871
Hungary.....	65,413	51.23	6,541
Italy.....	139,115	45.26	13,911
Holland.....	14,250	26.53	1,425
Belgium.....	8,762	43.42	876
Switzerland.....	42,382	51.69	4,238

In conclusion I would say that, although this investigation does not seem to lead to very precise results, yet it may be of value in the following directions:—

(1) These differences which we have discovered among the different nationalities may serve to confirm the results as to mortality among the foreign born, which it is supposed will be presented by Dr. Billings in the mortality statistics of the Eleventh Census.

(2) The investigation may serve to show that the census enumerators, in the case of certain classes of the population, meet with peculiar difficulties in getting complete returns. This is not intended as in any sense an attack upon the integrity of the Eleventh Census, but as pointing out those cases where any enumeration is apt to be incomplete.

(3) This investigation may be of sociological interest in showing that the character of the immigration from different countries varies greatly. The question whether immigration is permanent or temporary must be of great importance in judging of the influence of that immigration both upon population and upon social institutions.

THE VALUE OF PERCENTILE GRADES.

BY LUTHER GULICK, M.D.

Read before the AMERICAN STATISTICAL ASSOCIATION, Feb. 10, 1893.

This paper might be called with greater propriety "A criticism of a certain use of the Percentile Grade system."

It is with considerable diffidence that I present this paper to you, as I am aware of the blunders which novices so commonly fall into, errors which might easily have been avoided had the work been done by those more experienced, or having had better training. I am keenly conscious that there are few fields which offer more hidden traps for unwary feet than does that of statistical study. I venture, however, as it seems that there are few others who are at work on just this phase of these problems, and I feel sure that your discussions will show errors that I, as well as others, may avoid in the future.

In estimating the value of work one must bear in mind the end for which it is done. The ends for which I have used Percentile Grades, and on which alone I can judge as to their value are,—

First, to show as far as may be the bony and muscular form, function, growth, and proportions of homogeneous wholes, individuals, and classes as compared to each other, and also to make comparison between the different items in the whole, the class, and the individual. I use the term "homogeneous wholes," for it is unnecessary to explain that only such can be tabulated to any purpose. Thus, it would be of no value (for the purpose which I have mentioned) to tabulate the measurements of men and women together.

Second, to ascertain if possible those proportions and functions of the body which should be sought after.

Third, to awaken and maintain interest in physical exercise among those who need it.

It will thus be seen at once that I exclude the ends for which the percentile grade system was designed, and for which it is surpassingly useful and reliable. I write simply from the standpoint of a teacher of physical education, who has used this method in the endeavor to secure certain definite results bearing on his work. The second aim is the one to which most particular attention has been directed.

During the past six years we in this country have been treated to a flood of anthropometric data, which if carefully prepared would have been proved sufficient to put the whole subject on a far advanced plane. It is to be regretted, however, that nearly all that has been done in this direction has been done without careful attention to method. The method which of late has been attracting the most attention is what seems to me an unjustifiable use of percentile grades. This scheme has been put to uses which not merely do not represent facts, but disproves them, and proves falsities to be true.

This method of statistical study in anthropometry has been adopted by our largest colleges, and has carried all before it. We have all been in the habit of having our measurements taken, then, and plotted on a chart, thus producing a line which purported to be a comparison of ourselves in all these different items with the normal standard, and which would enable us to compare each part of our body with every other part, in order to distinguish which parts were deficient. The whole being designated to stimulate us in our endeavors to acquire symmetrical forms according to this standard.

No explanation has ever been given as to why this method should show these standards, nor, as far as I know, have any questions been asked in this direction. Coming from such eminent sources it has swept all things before it, and blinded the eyes of all who might otherwise have felt inclined to examine it more critically.

We have before us a percentile chart. It is constructed

as follows: A large number of different individuals are measured uniformly. These measurements are then sorted and arranged in rows under each item so that the highest shall be at one extreme, the lowest at the other. Sometimes this is done by making piles of the cards on which the measurements have been taken. This, it seems to me, is a cumbersome method, and does not afford opportunity for adding to these lists, nor verifying them at a later time. But, by arranging them in tabular form in a book, and making a dot for each measurement, these difficulties are overcome. Let us say that we have ten thousand individuals from whom the chart is to be constructed, and that we have already arranged them in the way mentioned. We are now working, we will say, on Girth of Head. Counting one hundred from the lower end, we find that the one-hundredth card reads 525 M. We then set down this figure immediately after Girth of Head and mark it one per cent. This means that out of the ten thousand individuals one hundred, or one per cent, are either equal to or smaller than that figure. We then count off four hundred more, making a total of five hundred, find our figure 534, place it next beyond one per cent, and label it five per cent. We count five hundred more, coming to 540. This is ten per cent of the whole; we put this down, and so we go on making the divisions or the per cents as large or as small as we please. We take next Breadth of Head, and treat it similarly, placing the figures directly beneath Girth of Head, so that the one per cents come in the same column. We thus get all the measurements of the body, or measurements of the individual. We include not merely linear measurements, but all which are capable of numerical representation, such as strength, as shown by the dynamometer, capacity of lungs, and the like. We now have a percentile chart, and any given horizontal set of figures is a set of percentile grades, and forms a percentile class.

This method of construction is the one in most common use, but is less accurate than that proposed by Mr. Francis

Galton. To use this chart we take the measurements of an individual in all the usual items, and make dots on the chart which correspond to the measurements of the individual in that item. We then connect these dots by a line. This produces a more or less broken line, which represents the absolute measures of the individual, and which purports to represent his relations to the standard, and the relation of his parts to each other. Thus it is taken for granted that if a man's height falls under the twenty-five per cent class his weight should also fall there, the girth of his chest, and so on. The individual measured is now supposed to take this chart and endeavor to straighten his line. If the chest girth does not correspond with the rest of his line, he is to bring it up, if possible, to the standard by breathing exercises.

This scheme is on its face delightful, for it does away with the assumed fallacy that all should be the same height. In a measure it appears to make every man his own standard, so that a man's forearm shall be in proportion to his wrist, and not to that of some one else, and it gives us a convenient way of representing the relation of the individual to the whole.

Instead of taking an individual and thus plotting him, as it is called, we can take the mean measures of a class and plot them, showing how this class compares to this standard which has been secured.

We have now constructed our percentile table, and we have before us the percentile grades concerning whose value we are inquiring. We are told that the fifty per cent is identical with the mean. *By mean I refer to the value of a perpendicular in a binomial curve, which arising from its base extends to its summit.* Thus, *where there is no binomial curve there is no mean.* The mean involves the operation of the law of variation.

This percentile scheme, however, can be worked out for any class of objects whatever, whether they correspond or not to the law of variation. Thus we can get the percentile heights of all the chairs in this room, but it is highly improb-

SECRET

1.

... ..

Country	Percentage of Population Aged 15 and Over Who are Illiterate in 1990
Argentina	15
Brazil	25
Canada	10
China	15
France	10
Germany	10
India	65
Italy	10
Japan	10
Korea	10
Mexico	25
Pakistan	70
Poland	10
Russia	10
South Africa	10
Sweden	10
Switzerland	10
Taiwan	10
Thailand	10
United Kingdom	10
United States	15

DI
OI
s t
Un

Left Thigh.

45

47

48

49

50

51

51

52

53

55

54

able that we could get a true binomial curve from these heights, since we might easily find that the shortest or the highest chairs were the most numerous (or were more numerous than those of any other height). The percentile scheme implies that there is always a central standard. If we could measure all the bricks in the country we should find the great majority of them were a certain size than which there are few smaller, the variations being almost entirely towards the larger sizes. We could very easily arrange their dimensions in a percentile chart, but if we constructed a curve with them we should find that instead of being symmetrical the class of smallest bricks would have in it the greatest number, and from there it would slope down, by various jerks, to the largest brick that was made. I once arranged a percentile table of the age of members of a certain Young Men's Christian Association. The age limit was 17. I was able, however, to grade them off very nicely, bringing the 50 per cent up to about 22. I then constructed a curve, but found that there were more individuals at 17 than at any other point, 18 coming next, 19 next, and all forming a regularly descending line, though not a binomial curve. Thus, this objection is simply that we must construct the curve for each item, or in some way establish that it is a true binomial curve before we have any right to make it conform to the percentile scheme. This is the first difficulty.

Second, it is assumed that the various items are so related that taking any given percentile grade in each we shall have a set of numerical values that will represent the symmetrical man. Thus because five per cent of men have a weight of 51 kilos, and five per cent of men have a height of 1.625 M., and five per cent of men can lift but 112 kilos, therefore the individual man who is 1.625 in height ought to weigh 51 kilos, and should be able to lift but 112 kilos. This can perhaps be answered by an examination of a percentile table, which is included on an accompanying sheet.

It is only fair to Dr. Hitchcock to say that he apparently has fallen into the error that is under discussion, for the claim that it is a "standard of symmetry" is not made for it. This particular table is used in preference to those from elsewhere, inasmuch as the *same* measurements from which it was constructed have also been treated in other ways, and thus form an unusual opportunity for the comparison of methods.

At the extreme left is the column indicating the per cents. Thus we notice under five per cent weight 51 kilos, and height 1.625 M. This means that five per cent of the total number examined fell below 51 kilos in weight, and below 1.625 M. in height. Looking along further in the same column we find under chest dip 0, and under chest pull up 3. Thus five per cent of men cannot dip at all, and can pull up 3 times or less. There is no question that each of these items gives us a definite and useful fact. It is now assumed by some that because a given man weighs 51 kilos that therefore he ought to be but 1.625 M. in height, pull himself up but three times, and not dip at all. In other words, that these figures in any given column of per cents represents the symmetrical standard. In Table II, column B, we find the measurements of all men who are from 1.620-1.630 in height averaged. Note that they can dip 8.8 times, and pull up 10.6. Turn again to the percentile and note that the man 1.827 M. in height can or should, if the assumption is true, dip 14 and pull up 16 times. Turning again to Table II, note column C, which gives the average measurements of the man between 1.820 and 1.830 in height. The man of this height can dip but 5.6 and pull up 8.1 times. Thus we secure two sets of results. The man 1.625 in height pulls up either 3 or 10.6 times, and the man 1.825 in height pulls up either 16 or 8.1 times, according to the method employed in tabulation.

It will doubtless be objected that only items that are more closely related than are height and strength should be tabulated into percentile classes and be expected to produce

TABLE II.

		A.	B.	C.
WEIGHT.....		61.2 Kilos.	54.1	68.3
STATURE.....		M. M. 1,725	1,620	1,820
HEIGHTS.	Sternum.....	1,410	1,300	1,480
	Navel.....	1,030	962	1,090
	Pubes.....	860	810	919
	Sitting.....	903	869	939
	Knee.....	476	439	519
LENGTHS.	R. Sh. Elbow.....	373	} 361	396
	L. Sh. Elbow.....	371		
	R. Elbow Tip.....	461	} 436	486
	L. Elbow Tip.....	459		
	Right Foot.....	260	} 244	274
	Left Foot.....	259		
	Stretch of Arms.....	1,780	1,690	1,890
Horiz. Length.....		1,732	1,640	1,820
GIRTHS.	Head.....	572	562	583
	Neck.....	349	340	356
	Chest, repose.....	880	854	898
	Chest, full.....	927	888	953
	Belly.....	724	703	748
	Hips.....	893	864	922
	Right Thigh.....	517	} 500	525
	Left Thigh.....	512		
	Right Knee.....	361	} 341	368
	Left Knee.....	359		
	Right Calf.....	359	} 332	355
	Left Calf.....	349		
	Right Instep.....	245	} 231	246
	Left Instep.....	242		
	R. U. Arm.....	257	} 246	261
	L. U. Arm.....	253		
	R. U. A., cont.....	295	} 280	300
	Right Elbow.....	251		
	Left Elbow.....	247	} 240	254
	Right Forearm.....	267		
	Left Forearm.....	261	} 250	266
	Right Wrist.....	166		
	Left Wrist.....	165	} 161	170
BREADTHS.	Head.....	155	151	156
	Neck.....	108	106	109
	Shoulders.....	430	418	440
	Nipples.....	108	192	206
	Waist.....	250	245	263
	Hips.....	323	315	341
STRENGTHS.	Kilos.			
	Lungs.....	1.5	1.4	1.1
	Back.....	137	126	147
	Legs.....	166	147	174
	R. Forearm.....	41.5	} 33	42
	Left Forearm.....	38.1		
	No. of times.			
	Dip.....	6	8.8	5.6
	Pull Up.....	9	10.6	8.1
LUNG CAPACITY.....		Litres. 3.77	3.25	4.43
PILOSITY.....		Tenths of Body. 2.25	2.4	2.06

straight lines with symmetrical individuals. To answer this I refer you back to Table I.

I have taken Dr. Hitchcock's averages for the men, 1.62 and 1.82 M. tall, found in Table II, Columns B, C, and plotted them on this percentile chart (Table I). You notice that they do not correspond at all in certain particulars; in other particulars they correspond very well. I have rearranged the items on the chart to a slight extent, so that all the bone lengths come together; otherwise the chart is in its original condition. It is first to be noted that the line of the man 1.620 M. in height pursues a course in the main between five and ten per cent as far as Horizontal Length. Here it takes a sudden drop and does not again reach the ten per cent line. Notice, similarly, that the man 1.820 M. in height (the lower line) makes a line similar in its general outline to the shorter man, but reversed from it. From this it is easy to deduce that the bone lengths vary with the height, but that the girths do not. Tall men have smaller muscles in proportion, and short men larger muscles in proportion, than would be indicated if the percentile line was accepted as the standard of symmetry. This assumption can be shown in a humorous way by the following illustration: Because ten per cent of men wear full beards, and ten per cent also weigh 157 pounds or over, it does not follow that the man who wears a full beard should weigh 157 pounds or over. The relationship between these two items must be established before any such deduction could be made.

Third. Another difficulty with this use of the percentile method for the objects stated is that it assumes that there are no different types, that there is but one standard of symmetry. This would be like the assumption that there is but one standard for all different nationalities. If we could measure all the individuals in the world, or at least a large proportion of them, we should no doubt get some interesting statistics, but to measure an indefinite number of African pygmies and Europeans and construct a percentile table from

them would be on its face absurd. We have different types of men, shown by the various forms of old Greek statues, any of whom may be said to be symmetrical. The same may be said of our modern athletes.

More important, perhaps, than this is that there seems to be a difference in the proportions of tall men and short men, that is, growth in girth of bone and muscle does not seem to correspond with growth in length of bone, so that as a matter of fact instead of finding that tall men are simply big little men we find that they have other standards, and are not similar in proportion to short men. Any scheme of statistical study which ignores this, or which renders its proof impossible, is useless for the purpose mentioned at the opening of this paper.

There is, however, another view that should be taken. The mean and the percentile scheme properly used show us what we are. These values have a wonderful stability and certainty. But we are told by some that this mean also tells us what *we ought individually to be*, giving us the ideal (not merely the type) of the race, the goal that is before us, and toward which we should all press.

If we lived under ideal conditions, then it would be true that the mean would represent the central standard; but we are not under ideal conditions, and securing the mean from us, as we are now, and affirming that it is the standard to which we should conform, would be like taking the mean of ten thousand cases of dyspepsia and saying that all should conform to the mean of these. It would be like taking the measures of the waists of ten thousand college girls, who notoriously do more mental and less physical work than they should, a great majority of whom have more or less constriction at the waist, and saying that this represents the standard around which the world revolves. It represents, and will continue to represent, the actual condition of things, and will not change from century to century *until the conditions change*. Only by different conditions can we get a different mean.

It is the business of all reformers to spur people on, not towards a mean, not towards a central standard of what people already are, but towards an ideal. If it were true that the moral sense of as many people is too acute as it is true that the moral sense of the people is too blunt then the mean would represent the ideal, but who would wish to say that the mean of the moral sense of the people (if he had a method of ascertaining it) would represent the ideal toward which we should struggle?

It follows, then, that no matter how accurate the mean, nor how desirable the percentile, scheme for the giving of light on certain difficult aspects of anthropology, it is of doubtful value, when used as indicated, for the securing of an ideal standard which shall be of practical value in directing physical exercise.

I believe that it is incumbent upon those who criticise to suggest something better. I would suggest, then, that methods of anthropometric statistical study should be adopted which take nothing for granted, and which will allow any peculiarities or unexpected laws in physical growth, etc. to show themselves.

I am at present working upon the following, for which, however, no special originality is claimed: I endeavor to secure, from as many gymnasia in the country as will co-operate with me, the measurements of those individuals who have lived, as far as may be ascertained, under approximately ideal conditions of work, and rest, and food for a term of years. These I propose to tabulate, forming a table which will appear somewhat like the percentile, but in which the mean of the individuals of each group in height will be taken, all tabulated together in the construction of the central class alone. Thus, if there are differences in structure they will show themselves. If there are not they will not. I shall not expect by this to get an ideal standard. I do expect, however, to get a standard which will be very much nearer the ideal than we could get by tabulating the measurements

of a great number of individuals, nearly all of whom are confessedly below par in most respects.

In the brief discussion of the above paper it was evident that the impression was given that a general criticism of the percentile system was intended. I had no such thought in mind, for I recognize that in this method we have a way at arriving at many facts that are otherwise beyond us. What I did intend to criticise was, 1st, the assumption that the measurements of an individual should fall in a straight line on one of these charts; and, 2nd, that this should be taken to be the standard of perfection in form.

REVIEWS AND NOTICES.

MORTALITY EXPERIENCE.

Mortality Experience of the Australian Mutual Provident Society. 1849-88. Compiled by Richard Teece, F.I.A., Actuary and Manager.

This is a very complete and exhaustive analysis of the mortality experience of the largest Australian company, covering an aggregate of 114,471 lives. These statistics are of unusual interest to actuaries, owing to the fact that this company has been under an actuary as chief ranking officer and actual manager. The business man who is so prominent in American companies, and often so contemptuous about mere theorists, is relegated to the background. This actuary manager has dared to follow his nose, too, without troubling too much about the difference between theory and practice. The consequence is that the statistics under consideration deal with a variety of subjects not so common in compilations of this sort, because of the want of data.

Among these subjects are: the effect of an absolutely free surrender system on selection; the effect of classification of risks upon the mortality; the effect of initial selection, as shown by comparing the mortality for the first five years of insurance with the mortality of later years; the mortality of annuitants; the effect of maternity upon the mortality of females; the result of conscious selection of endowment insurance upon the mortality; the influence of occupation and nationality on the mortality; the mortality according to amounts at risk in comparison to lives; the rate of discontinuance as affected by the liberal surrender privileges; the mortality from various diseases.

The mortality of the company is low, though not lower than some American companies, which have not published their experience, claim to be experiencing. It is, however, lower than any experience which has been submitted to the scientific world, being an average of but $67\frac{1}{2}$ per cent of the mortality according to the H^m table. The experiment of insuring diseased lives, by adding to the actual age,

has been fairly successful, resulting in a mortality but very little in excess of the average. An exhibition of the principles upon which the company discriminated would be very instructive, and it is to be hoped that to this the medical officers will next turn their attention. The number of lives in this class is large, comprising fully one-third of the whole. The result of the conscious selection of endowment insurance by the best lives is found to be a diminished mortality. This is harmonious with the received ideas on that subject, and if by endowment insurance is meant any insurance which puts a premium on living, there would seem to be good sense in support of the statistics. Precisely contrary to received ideas is the effect of an absolutely free surrender system, coupled with most absolute non-forfeiture provisions; it is found that the effect is rather beneficial than otherwise, no adverse selection taking place. It is likewise found that a less surrender and lapse rate is experienced than in companies which discourage discontinuance under pain of forfeiture. This anomaly is perhaps explained by the fact that a man is permitted to borrow on favorable terms nearly as much as he can obtain upon surrender. As I have elsewhere pointed out, there is also good reason to believe that actuaries are counting too much on the reason of mankind in assuming that men will on the average act for their own interest; there is every reason to believe that the obstinacy of the average individual impels him to rebel against restraints which he considers unjust, and to be the more obstinate about it. The results of this investigation appear to confirm that view.

The mortality of women because of maternity was not found to be in excess of the greater mortality from other causes among males. The principal thing which stands in the way of the free insurance of women is the difficulty of securing a satisfactory examination, which difficulty seems likely to disappear now that so many women are entering the medical profession. The mortality from various diseases shows, as might be expected, a considerable variation from the American and English experiences. There is a lower percentage from consumption, a higher from intemperance and from violent deaths, which latter the medical officer ascribes to the newness of the country. The mortality among annuitants is found to be considerably lighter than among insurers, which agrees with all previous statistics. There seems to be good reason to conclude that native Australians are better lives than immigrants from other countries.

All in all, the compilation is very scholarly and instructive, and is a distinct advance in the matter of life insurance statistics. It also seems to prove conclusively the superiority of "theorists'" management.

MILES MENANDER DAWSON.

BULLETINS OF THE CANADIAN CENSUS.

No. 1. August, 1881. *Preliminary Returns of Population.*

No. 2. October, 1891. *Population of the Sub-Districts of the Province of Ontario.*

Twenty-nine counties show an increase and twenty-one a decrease in population. The decreases are attributed (1) to the difference in the mode of counting the people. Severe rules were adopted to prevent duplications. A time limit in taking the census was adopted. There was far less duplication. (2) To the movement of population westward to the virgin soil, and from the country to the city. (3) To the introduction of agricultural machinery, which has done away to a certain extent with hired help. (4) To the denudation of the forests, which has driven out the lumbermen and mill hands. (5) To the opening up of 6000 miles of railway. (6) To the development of mining industries in Algona and Nipissing, which has driven a considerable number from Ontario.

No. 3. November, 1891. *Population of the Eastern Maritime Provinces.*

The increase in these provinces was very slight between 1881 and 1891. The family is becoming smaller, due to the decrease of early marriages and increasing tendency to celibacy. This accounts, in a measure, for the small increase in population, for while the population increased 1.2 per cent the number of families increased 4.1 per cent.

No. 4. December, 1891. *Population of the Province of Quebec.*

The population increased 9.5 per cent and number of families 7 per cent.

No. 5. February, 1892. *Population of Manitoba, Northwest Territories, and British Columbia.*

It took an enumerator 164 days to enumerate the people who lived in one of the districts of British Columbia, and the total number of persons recorded in this district was 2420, an average of about 15 a day.

No. 6. February, 1892. *Dwelling Places of the People of Canada.*

There are 930,684 dwellings. Of these 250 were built of sod, and there were 10,555 shanties. Of the 919,879 houses 54,164 were empty and 10,873 under construction. There is a greater increase in dwelling places than in population, which indicates that the population is better housed. Of the 854,842 inhabited houses 131,522, or 15.3 per cent, were of brick, and 25,964, or 3.1 per cent, were of stone. Of all the inhabited dwelling houses 39 per cent are one-story buildings.

No. 7. March, 1892. *Live Stock in the Northwest Territories.*

No. 8. April, 1892. *Manufactures.*

Relates to the number of industrial establishments, value of machinery and tools, the number of employes, and number of steam engines. The proportion of men, women, boys, and girls in every 100 wage-earners employed in factories and workshops is as follows:

	1881.	1891.
Men,	76.07	73.67
Women,	16.29	19.12
Boys,	5.56	5.28
Girls,	2.08	1.93
	<hr/> 100.00	<hr/> 100.00

No. 9. May, 1892. *Religions.*

The Methodists have made the greatest proportionate increase in the Dominion, as a whole. They are followed by the Presbyterians, Church of England, and the Catholics. The Roman Catholics constitute 43.17 per cent of the population and the Methodists 17.90 per cent.

No. 10. June, 1892. *Manufactures.*

It is estimated that each workman produced in 1891 \$1292.44, and received in wages \$271.20, or 21 per cent. It is reasoned that capital is receiving a proportionately less share in the product than in 1881.

No. 11. June, 1892. *Birthplaces of the People.*

The following table shows the component parts of the population of the Dominion on the basis of 10,000:—

	1881.	1891.
Native born,	8,580	8,650
Born in England,	390	460
" " Scotland,	270	230
" " Ireland,	430	310
" " Newfoundland,	10	20
" " other British Possessions,	6	10
" " European countries,	91	110
" " United States,	181	170
" " other countries,	42	40
	10,000	10,000

No. 12. July, 1892. *Manufactures in Cities, Towns, and Villages.*

No. 13. August, 1892. *Wages.*

Returns are made for the first time as to whether manufacturing establishments run full or half time. In the year ended April, 1891, 64.3 per cent worked full time.

No. 14. September, 1892. *Mortality.*

Evidence is introduced to show that the returns of deaths are fairly accurate. According to the returns the death rate in 1890-91 was 14.10 per 1000. In the Province of Quebec and in Ontario the death rate of the French Canadians is much higher than that of the rest of the community. Mortality tables according to age periods are also given. Over two-fifths of the deaths were of persons who had not reached the fifth year. The birth rate is estimated at 28.3 per 1000. In the Province of Quebec it was the highest, 36.86.

No. 15. January, 1893. *Mortality.*

This supplements Bulletin 14 in giving the causes of death. The classification of the Registrar-General of England is adopted.

REPORTS OF LABOR STATISTICS.

Third Biennial Report of the Bureau of Labor Statistics of Minnesota, 1891-92. L. G. Powers, Commissioner. Minneapolis, 1893. Pp. 446.

This report is composed of four parts, as follows: 1. Factory Inspection; 2. Inventions in Flour-Making Machinery, and the Prices of Wheat, Flour, etc.; 3. Trade Unions; 4. Mortgage Foreclosures and Redemptions and Land Values in Minnesota in the Years 1881 and 1891.

Much of the material is of a descriptive and historical character rather than statistical. This of course in no way detracts from its value, for the material is much better presented than is frequently the case in similar reports. An effort is made to collect statistics of accidents in factories, but the Board finds great reluctance on the part of employers to make true returns.

The question of factory accidents has led the Bureau to inquire into the workings of the German Accident Insurance Act, and tables are reprinted from the *Statistisches Jahrbuch* for 1892, presenting the results for the year 1890.

The chapter on Trade Unions describes at length the history of twenty of the principal workmen's organizations in the United States.

Tenth Annual Report of the Bureau of Labor of Michigan, Feb. 1, 1893. Henry A. Robinson, Commissioner. Lansing, 1893. Pp. 1353.

This bulky volume is made up of various compilations, somewhat heterogeneous in character. Section III, for example, "treats of sociology, giving some explanations of the tenents thereof." Part II contains an investigation of the building trades; Part III contains the investigation of mortgage indebtedness; Part IV relates to royalties on the unearned investments of mines and timber; Part V treats of pauperism and the defective classes; and other portions deal with the cost of living, farm mortgages, and strikes. The Michigan Report is in need of more careful editing.

Fifth Biennial Report of the Commissioner of Labor, Census, and Industrial Statistics. Wisconsin, 1891-92. Madison, 1892. Pp. 175.

About one-half of this report is devoted to statistics of the building trades and of manufactures. The other portion is a record of factory inspection. Statistics are largely confined to wages and hours of labor.

Fifth Annual Report of the Commissioner of Industrial Statistics of Rhode Island. Providence, 1892. Pp. 191.

This issue is devoted exclusively to children and child labor. It is found that the employment of children is not so great as formerly, although the population has increased. The total number of children employed is 5273, of which 2977 are boys and 2296 are girls. By age these are classed as follows:—

10 years of age,	264
11 " " "	381
12 " " "	935
13 " " "	1,134
14 " " "	2,339

55 per cent of the children are native born, and 45 per cent foreign born. 80 per cent have foreign born parents. The greatest number of children are employed in the cotton and woollen industries. Statistics of wages are also added.

Seventh Annual Report of the Bureau of Labor Statistics of Connecticut for the Year Ending Nov. 30, 1891. Hartford. 2 vols. Pp. 1510.

Mr. Samuel M. Hotchkiss, recently Commissioner of Labor Statistics in Connecticut, undertook a most laborious but useful task in devoting the energies of his office to an inquiry of the fraternal mutual benefit societies in operation in his commonwealth. He accordingly brings together the results of his investigations relating to the fraternal mutual benefits societies of all kinds; life, sick, and funeral benefit; trades unions with sick and funeral benefits; and endowment societies. The inquiry covers five years, and the results are full of interest.

There are in Connecticut 386 fraternal mutual benefit societies of all kinds, with 974 branches or lodges. The membership at the close of the year 1891 was 126,613, of which about 8000 were women. 116 of the societies insure lives. In 1891 all the societies received from their members \$1,411,458, and expenditures were \$1,159,515, divided as follows:—

Sick and funeral benefits,	\$319,190
Death payments,	465,245
Expense of management,	296,722

A summary of these statistics is presented in the following table:—

NUMBER AND PERCENTAGE INCREASE OF MEMBERS. ALL SOCIETIES BY GROUPS AND YEARS.

Years.	All Societies.			Life.			Sick and Funeral Benefit.		
	Members.	Increase.	Percentage of Increase.	Members.	Increase.	Percentage of Increase.	Members.	Increase.	Percentage of Increase.
1887	74,554	.....	.....	20,848	.....	.....	46,092	.....	.....
1888	85,739	11,185	15.00	24,597	3,749	17.98	52,950	6,858	14.87
1889	95,829	10,090	11.77	27,839	3,342	13.18	58,643	5,693	10.75
1890	111,587	15,758	16.44	30,729	2,890	10.38	69,232	10,589	18.05
1891	126,613	15,026	13.47	32,898	2,169	7.05	79,921	10,689	15.43

(Table continued.)

Years.	Trade Unions.			Endowment.		
	Members.	Increase.	Percentage of Increase.	Members.	Increase.	Percentage of Increase.
1887	7,614	....	....	.....	.....	.....
1888	8,124	510	6.69	68	68	100.00
1889	8,492	368	4.52	855	787	1,157.35
1890	9,239	747	8.79	2,387	1,532	179.18
1891	10,042	803	8.69	3,752	1,365	57.18

The statistics are well digested, and the whole work is worthy of study and reference.

NOTE ON LABOR BUREAUS.

Some time since an account was given in these *Publications* of the establishment in France of a Bureau of Labor. The information has recently been received of the foundation of a Labor Bureau in Great Britain with the well-known statistician, Mr. Robert Giffen, at its head. It is gratifying to note the influence of our own Department of Labor in this connection. Dr. E. R. L. Gould having contributed a decided impetus to the movement towards the creation of the Bureau. In December, 1892, he appeared before the Labor Commission, now sitting, and gave a lengthy and exhaustive testimony in regard to the labor bureaus in the United States. Being plied with innumerable questions, he has given a very interesting and very accurate account of the Department of Labor, which contains perhaps the best statement which has been made of its work and methods. As Dr. Gould had been several years in Europe, it does not detract from the value of his testimony to note a slight inaccuracy in regard to an event of recent date. Dr. Gould was incorrectly informed in representing that the Department of Labor was unwilling to take up the work recently assumed under the direction of the Finance Committee of the Senate, and disowned responsibility for the results (No. 6512). The Commissioner, on the contrary, was glad of the opportunity of doing this statistical work despite the burden upon his office which it involved. He limited his work and his responsibility, however, to the collection of the facts, leaving to the committee the labor and responsibility of the analysis of them.

Of equal interest with the account of labor bureaus in the United States is Dr. Gould's testimony in regard to the progress of statistical work along social lines in Europe. Here we let him speak for himself. In reply to a question (6748) of Prof. Marshall, as to the spread of the movement in this direction, he said: "Unquestionably, the movement for the development of labor statistics is taking a very wide extension everywhere. I remember at the Congress, which was held in Vienna last year, the Congress of the International Institute of Statistics, the bulk of the more distinguished statisticians enrolled themselves as members of the committee on labor statistics. That was the first indication. The second thing which resulted from the Congress was a resolution from this committee urging upon the attention of different Governments the importance of organizing statistical agencies to deal, in a greater measure than hitherto, with labor and social questions, with the expressed conviction of opinion that that was the most satisfactory way in which we could approach the study of the subject. Since that time there have been called into existence commissions in Austria and in Germany to study the question, in order to find out in what direction they can best enlarge the study of labor and social statistics. I had a talk the other day in Berlin with Dr. Geheimerath Von Scheel, who is the director of the Imperial Statistical Bureau, Berlin, in which he said that they were now discussing the question, and that it was only a matter of a short time when they should have, if not a distinct bureau of labor statistics, at all events, a development on one side of his department which should consecrate itself solely to that work. I had a letter a short time ago from Dr. Inama-Sternegg, who is the president of the Imperial Statistical Commission in Vienna, asking me for information in relation to the latest development of American labor statistics, saying that they were determined to extend the Central Statistical Commission in Vienna, by adding to it a section which should give itself to the study of labor statistics. Shortly before that I was in Norway, and in conversation with Dr. Kiaer, who is the chief of the Royal Statistical Bureau of Norway, he told me that he was, on his own responsibility, without an increased appropriation, giving himself now to the collection of labor and industrial statistics. The other day in Brussels, I had an exceedingly interesting conversation with M. Beernaert, the Prime Minister of Belgium, and M. Leo de Bruyn, the Minister of Agriculture, Commerce, and Industry, and both of them told me that

they were organizing a distinct labor bureau, on the model, as far as they could make it applicable to their country, of the Department of Labor of the United States. Still a little further back I had the pleasure of assisting at the organization of the French *Office du Travail*, and giving information before the superior council in somewhat similar fashion to what I am now giving you today. These things, I think, are plainly indicative of the fact that nations are becoming alive to the point which I have just been endeavoring to make, not to the experimental or possible benefit, but to the certain benefit, judging from the past utility of these organs of original social inquiry."

REPORTS OF CHARITIES AND CORRECTIONS.

Fifth Biennial Report of the State Board of Corrections and Charities of Minnesota for the Year Ending July 31, 1892. Minneapolis, 1893. Pp. 256.

Reference has been made in previous issues of the *Publications* to the admirable system followed in tabulating the statistics of charities and corrections in Minnesota under the direction of its secretary, Rev. H. H. Hart. The classifications are clear and easily understood. A summary presents the number of public charges in each million of the population.

	In the United States.	In the North Central States.	In Minnesota.
In state prisons.....	722	491	332
In county jails.....	312	189	160
In juvenile reformatories.....	328	250	218
In almshouses.....	1,166	1,145	280
Insane persons.....	1,698	1,649	1,693
Dependent children.....	.....	.....	424
In soldiers' homes, etc.....	.....	.....	.....
Of each 10,000 veterans.....	287	298	179

This is a most favorable showing for Minnesota, and would indicate that her immigrants have been of a higher standard than in other portions of the country. The ratio of paupers to each million of inhabitants was in June 3942, and in December, 5274. In some of the counties the ratio is more than twice as large. The average cost

per inhabitant for support of paupers is 23.7 cents. A strong plea is advanced in favor of a registration of paupers and criminals, a system carried out only in Massachusetts.

Twelfth Biennial Report of the Board of State Commissioners of Public Charities of Illinois. Springfield, 1893. Pp. 326.

As Mr. Wines, the secretary of the Illinois Board of Public Charities, has charge of the pauper and criminal statistics of the Eleventh Census, it is natural that special attention should be given in the state report to the statistical aspects of crime and misfortune. This is done in Chapter IV. It is concluded that the aggregate burden of the insane, idiots, deaf and dumb, blind, paupers, and prisoners is much greater than it was forty years ago. The actual numbers in the United States of each class reduced to ratios per million of the whole population give the following table:—

RATIOS.

Classes.	1890.	1880.	1870.	1860.	1850.
Insane.....	1,697	1,833	971	765	673
Idiots.....	1,526	1,533	636	602	881
Deaf and dumb.....	659	675	420	408	423
Blind.....	805	976	527	403	422
Paupers.....	1,166	1,320	1,990	2,638	2,171
Prisoners.....	1,315	1,169	853	607	290

“According to the foregoing statement there has been a surprising relative increase in the number of insane, idiots, deaf and dumb, and blind during the past twenty years. But this apparent increase is not real. It is due to the improved methods of enumeration of these special classes, introduced in the canvas of 1880 by Mr. Wines, with whom they originated, and they have been substantially followed by Dr. John S. Billings in 1890. The same remark applies to the enumeration of the paupers and prisoners; the relative number of paupers appears to have rapidly declined, and that of prisoners to have increased. But the figures are very misleading, and have given rise to many erroneous inferences.

“With regard to the so-called ‘defective’ classes it should be known that Mr. Wines, in 1880, supplemented the enumerators’ returns by correspondence with physicians, who added many names to the lists. This correspondence was not renewed in 1890, which accounts, at least in a large degree, for the seeming slight falling off

in the ratios in 1890, especially of the insane. It must further be said that Dr. Billings, for the first time in the history of the census, has attempted to enumerate all the deaf, including those deaf in one ear, or merely hard of hearing, and not included in the special class technically described as 'deaf mutes,' or the 'deaf and dumb.' He has also attempted to enumerate all the blind, including those blind in one eye, but able to see with the other. In the tables here given the blind in one eye and the deaf only, who are not deaf-mutes, are not included. But evidently the change in the method of enumeration may account for a part of the difference in ratio is between the census of 1880 and that of 1890.

"The census of paupers in 1880 and 1890 was confined to paupers in almshouses, and the figures showing the number 'outdoor' paupers returned are not included in the tables. Prior to 1880 it is obvious from inspection that the distinction was not made, and that the figures for previous years are based on no exact definition of the word 'pauper.' Hence, they are practically of no value whatever.

"Neither the paupers nor the prisoners were counted, before 1880, on any proper system, almshouse by almshouse, and prison by prison. It is well known that the figures are a guess, and a very bad guess at that. The figures of 1880 and 1890 are worthy of confidence."

Eleventh Biennial Report of the Michigan State Board of Corrections and Charities, 1891-92. Lansing, 1893. Pp. 169.

There are few general and comparative tables in this report. The aggregate daily average of inmates during the last year in penal institutions was 1179, an increase of only 15 as compared with five years ago. On the other hand, the Detroit House of Correction has an increase in monthly average of over 294. The total number of insane in state charitable institutions in 1892 was 3468, as compared with 2576 in 1887.

THE CIVIL SERVICE OF BUENOS AYRES.

Estudio Estadístico del Presupuesto Nacional seguido de un Proyecto de Reforma del Mismo, etc. By Francisco Latzina. 1893. Pp. 75. Tables.

In the introduction to this work the author states that since the establishment of the Republic the statutory law has become, little by little,

in the course of many years, a museum of incongruities. There does not exist any systematic method of specifying by names the different grades among the civil employes, or of giving equal salaries to officials nominally in the same class. In some cases, for example, in a single department, employes of the third class earn more than those of the first class.

This inquiry is intended to initiate a reform in the civil service, especially in this respect. As it is necessary to make an exposition of the actual state of affairs as a preliminary to proposing reform, there are given two tables showing, first, the different salaries in order of amount, and the various positions which receive the same salary; second, the various grades and classes of offices, and the inconsistent arrangement of salaries that exists. After this a series of tables sets forth the plan of reform proposed, with a systematic classification of offices in the different departments, and a logical method of determining compensations. There is also given a table of the estimate of expenses for 1892. This goes to some length, and to many of the more minute details, but does not attempt to give the resulting totals.

After these tables are the proposed laws regarding the civil service. Under four heads these provide for the reforms already mentioned; they also state qualifications necessary for public servants, as to examinations, *et cetera*, and provide for pensions for the superannuated and for the widows and children of public employes.

The relative importance of certain positions as considered in this South American state, shown by their respective salaries, is noteworthy. For instance, the salary of an accountant ranges from \$60 to \$600; that of a teacher or professor, from \$31 to \$200. The amounts of almost all the salaries are ridiculously small; for the cost of living is not very much less than here in the United States, and consequently the actual value of the nominal salary is not so great as here. Salaries often go unpaid for long periods,—just before revolutions, for instance. It may be true that the higher officials have “perquisites” to reinforce their salaries, but how can telegraph operators maintain themselves on from \$50 to \$100 a year? A gentleman, Mr. Johann Meyer, who has visited Buenos Ayres, says that even the humblest employes dress magnificently, and are very proud of their “governmental” office. Their relatives perhaps help support them for the social prestige the connection brings, and the official satisfies himself as to the rest with the honor.

The study as a whole is of decided interest, and shows a painstaking, complete, and minute investigation on the part of the author and compiler.

L. P. LANE.

ASSISTED EMIGRATION.

Del Patronato degli Emigranti in Italia e all' Estero. By Dr. Egisto Rossi. Relazione al Primo Congresso Geographico Italiano, Genoa, 1892. Rome, 1893. Pp. 93.

This paper gives a history of the development of the societies which have sprung up in every new country on the globe, to assist ignorant emigrants to start in life under the changed conditions. In the United States the Germans have been foremost in this direction, and have done a good work for their countrymen in many ways. Nearly all the European colonies in New York have organized in some way to protect and encourage those who come to the United States. They have built hospitals, and they dispense much money in charity; they take charge of savings, and find employment for those in search of work; they give legal counsel, purchase tickets, and even acquire homesteads; in short, they do everything in their power to make it easy for the ignorant and helpless to begin life anew. And this activity, while most pronounced in the great port of entry in the United States, is manifested in every place where immigration is present.

The great defect in the organization of the Italian societies is the lack of coöperation in the home country. The English government has offered a good example in this respect, and Sig. Rossi has shown most admirably the proper way to organize in Italy in order to secure the same result. The monograph contains many interesting statistics of the work done by these various societies, and is an eloquent plea for an extension of the work in Italy. It is, however, of no particular importance for American readers, except in so far as it shows the extent to which our seaports are flooded by a horde of people who come here totally ignorant of their own interests, and often almost penniless. In proportion as the figures show the need of charity among these people, so does it become more evident that the one problem from the American standpoint is to sift out this indigent and ignorant element before it leaves the shores of Europe. And here

alone it seems is the significance of this eloquent plea for us. We have more than enough of assisted emigrants; but if societies can be organized in Europe to inform emigrants as to the new conditions, to enable the more energetic and worthy ones to come under the most favorable circumstances, and to discourage all those who threaten to become charges upon the community, then will they be deserving of the most cordial support from our people. This seems to be the end desired by the author, and deserves hearty coöperation so long as its activities are strictly limited to the dissemination of information and the encouragement of deserving emigrants from Italy.

W. Z. R.

INDEX NUMBERS.

The following statement is made by Mr. Sauerbeck, in continuation of the figures supplied in former years in a communication to the Secretary of the Institute of Bankers (London):—

3 Moorgate Street Buildings, E.C.

12th January, 1893.

SIR:—

I have much pleasure in giving you the result of my index numbers of the prices of 45 commodities (1867-77 = 100).

1873	111	1887	68
1880	88	1888	70
1883	82	1889	72
1884	76	1890	72
1885	72	1891	72
1886	69	1892	68

The index number for 1892 is 4 points lower than that for the preceding year, and is on a par with 1887, the lowest figure on record. The great trade development in 1888-89 led to an enormous increase in the production of many commodities, and the depression which commenced in 1890, aggravated by the financial difficulties, by the effects of the McKinley Tariff, deficient harvests and the fall of silver, continued all through 1891 and 1892.

The various articles comprised in the group of corn declined almost uninterruptedly during the past year until, at the end of the year, English wheat had fallen to 25s. 8d. per quarter, the lowest price known for the last 100 or 130 years. The middling and inferior sorts of beef and mutton were depressed particularly towards the end of the year, but pork ruled distinctly higher than in 1891. Sugar did not vary to any great extent, but the lower classes of tea have risen sharply since the month of August. Coffee has now been on a very high level for about 6 years, and is the only

article the index number of which is above 100. Metals remained low, and coals were also much cheaper than in the two preceding years.

Textiles, which fell heavily in 1890 and 1891, were on the average again lower. Cotton middling American, on the spot touched 3 9-16*d.* per lb. in March, futures being even cheaper, and was practically on a par with the lowest price in 1848, which was 3½*d.* It rose, however, to 5½*d.* when it became known that the new crop would be much smaller. The average prices of wool were exceptionally low, and jute, very high at the beginning of the year, dropped about 50 per cent, but recovered again a small part of the decline. Oils were also lower than in 1891, and petroleum at or below 4½*d.* has never been so cheap.

The monthly fluctuations were as follows:—

1889 Dec.	73.7	1892 June	67.7
1890 "	71.1	July	67.8
1891 "	71.4	Aug.	67.4
1892 Jan.	70.0	Sept.	66.8
Feb.	70.0	Oct.	67.4
Mar.	69.1	Nov.	68.2
Apr.	68.9	Dec.	67.7
May	68.8		

The figure for September is the lowest touched during this century, and the index number for December is 5 per cent lower than at the end of 1891, and 8 per cent lower than in December, 1889.

The average price of bar silver was 39 13-16*d.* per oz., against 45 1-16*d.* in 1891, or about 34½ per cent under the old parity of 15½ silver to 1 gold, and the lowest price was 37½*d.* in August.

I remain, Sir,

Yours faithfully,

A. SAUERBECK.

ON SOME RELATIONS OF HUMAN STATURE TO MUSCULAR STRENGTH.

The following circular of information has recently been issued by the Physical Education Department of Amherst College.

It seems to be a prevailing idea that the physical strength of men when ascertained by comparative tests and in bodies well proportioned to the height is greatest in those of shorter bodily stature. Of course the acts of leaping, walking, throwing a ball, and similar feats would be better exhibited by men of longest limbs, because of longer leverage of trunk, arm, and leg. But when the muscles of a man are made to contract upon his own weight alone, we have been apt to think that the man of short joints has a better mechanical advantage against gravity than has the longer-limbed fellow.

Such has certainly been the notion with the Physical Education Department at Pratt Gymnasium, Amherst College. But, in order properly to test this opinion by numerical and statistical facts, some special observations have just been made at our Anthropometric Laboratory. Following the arrangement and method accepted by the American Association for the Advancement of Physical Education, the six strength tests of back, legs, forearms, lungs, dip, and pull up have been used for this study. These were taken of the twenty tallest men and the twenty shortest men in the classes of '89, '90, '91, and '92, and they have been collated, arranged, and averaged for the best purposes of comparison.

The accompanying tables show the aggregates of the items selected in each class of the tall men and the short men, the averages of each item, and the difference between them both in numbers and in per cent.

We find as a result of the study that the average height of the tall men is 1809 m. m., or 71.3 inches, and that of the short men is 1665 m. m., or 65.5 inches. And as the average of a college student for the past 31 years has been 1725 m. m., or 67.9 inches, it shows a wider range between the average and the short students than the reverse.

We also find the per cent of difference between the tall and the short men, in the three points in which the tall men surpassed the short ones, was 14.50. And the three points where the short men surpassed the tall ones gave an average of 10.25 per cent. So that taking the whole six items of comparison together we find 4.25 per cent in favor of the tallest men.

As far, then, as this little study is concerned it seems to show that the idea that the men of short stature exceed those of tall stature in test measurements of strength is erroneous.

The Department here has taken the ground that the stature (bodily height) is the normal or proper standard for physical work. That according to a man's height we should apportion his work, prescribe for his health, predict his development, and construct the typical men, or, as Mr. Charles Roberts puts it, "the total height being the most characteristic and important measurement of the body, the arrangement of the table of heights has been made the model for all the rest." And this monograph showing that the men above the average height give a greater range of strength than those below it, and that the

strongest men are among the tallest, give great promise to the proposition that stature is an all important factor in the study of anthropometry.

TABLE OF TEST MEASUREMENTS OF BODILY STRENGTH BETWEEN TALL AND SHORT MEN IN AMHERST COLLEGE, MARCH, 1893.

TALL MEN.

	Height.	Back.	Legs.	Forearms.	Lungs.	Dip.	Pull Up.	
Aggregate.	Class of '89	1800	3262	3867	897	328	152	195
	Class of '90	1816	3343	4285	935	348	168	203
	Class of '91	1814	3347	3999	834	326	115	167
	Class of '92	1805	3262	4249	906	312	156	197
Average.....	1809	165	305	45	1.64	7.4	9.5	

SHORT MEN.

	Height.	Back.	Legs.	Forearms.	Lungs.	Dip.	Pull Up.	
Aggregates.	Class of '80	1680	3017	3507	794	316	174	231
	Class of '90	1662	3030	3395	781	339	182	199
	Class of '91	1651	3080	3443	737	364	177	250
	Class of '92	1677	3190	3606	744	314	151	192
Average.....	1665	154	174	38	1.66	8.5	10.9	
Difference in measure.....	144	11	31	7	0.02	1.1	1.4	
Difference in per cent.....		7.25	17.75	18.50	1.25	14.75	14.75	

Height in millimeters ; Back, Legs, Forearms, and Lungs in kilos ; and Pull and Dip in units.

STATE LEGISLATION OF 1892 RELATING TO STATISTICAL INQUIRIES.

The citations indicate the State, Number of chapter, and Date of approval.

The following entries relating to statistics are found in the very valuable *State Library Bulletin* of New York (Legislative No. 3, January, 1893), devoted to summarizing and indexing the state legislation of 1892.

STATE CENSUS. Enumeration of inhabitants. Appointment of enumerators and duties of secretary of state. N. Y., 5, 20 Ja.

Enumeration of population of towns claiming to have 5000 inhabitants, with view to being chartered as cities. County court to divide such town into four districts, and appoint two enumerators for each.

Va., 595, 2 Mr.

BUREAU OF STATISTICS. Territorial librarian to be statistician. Deputies to be appointed by county courts. Utah, 46, 10 Mr.

INDUSTRIAL STATISTICS. Duties of chief of Bureau.

Md., 29, 25 F.

May require statistical reports from R. R. companies.

Ia., 27, 8 Ap.

STATISTICS OF CROPS AND LIVE STOCK. To be collected by assessors, reported to county auditors, and final returns made to state auditor.

La., 57, 25 Mr.

To present subjects of forestry and road making at meetings in counties. To collect statistics of agricultural, mining, and manufacturing industries, and information relating to abandoned farms, etc.

Vt., 7, 22 N.

SCHOOL CENSUS. Providing method of taking.

N. Y., 14, 17 F.

MORTALITY AND INSURANCE OF COLORED PERSONS.

The following summary is from *The Insurance Monitor*.

For several years bills have been introduced into the New Jersey Legislature designed to bring that state in line with New York and others which prohibit discriminations in life rates on account of color. This year, for the first time, the bill was successful in passing the legislature, and would have become a law had it not been for the activity of the Prudential in bringing the facts before the governor, which led the latter to file with his veto his reasons therefor, of which the following is a summary.

Gov. Werts, in his epistle giving his reasons for not signing the bill, says:—

The title of this bill is defective. It should be an act to provide for the regulation and incorporation of insurance companies, instead of incorporation and regulation, etc. I apprehend that the practical operations of the bill would prove disadvantageous to the colored race, that its

effect would be a denial to them of insurance in first-class companies. If there be companies, as alleged, which make no discrimination, this law is uncalled for as to others. If there be companies that do discriminate, the competition of the others will soon compel an equalization of rates, unless such discrimination be founded upon substantial grounds.

The governor files with his reasons a letter and a lengthy statement from John B. Lunger of Newark, actuary of the Prudential Company. He states that he made a special study of the mortality among colored people as compared with that of white, and from it deducts a table of figures. He has examined the mortality per 1000 persons insured in each class from 1883 to 1891, inclusive, and he finds the death rate as follows: 1883 — white, 15.30; colored, 23.41; 1884 — white, 15.27; colored, 18.75; 1885 — white, 16.04; colored, 22.47; 1886 — white, 17.90; colored, 24.44; 1887 — white, 16.59; colored, 21.68; 1888 — white, 16.60; colored, 21.43; 1889 — white, 15.14; colored, 21.49; 1890 — white, 17.11; colored, 21.40; 1891 — white, 16.07; colored, 21.44.

He further states that the colored people rarely insure in old-line companies, but seek to secure policies in the industrial companies, and the attempt to equalize the rates of insurance is principally aimed at the industrial companies. To further prove that the mortality is much greater among the colored people than white he secured vital statistics from the principal cities in the South.

His reasons for not getting vital statistics from the North is because they are not kept with a division in reference to color. The figures obtained from the South bear out the general proposition, but figures from the Northern localities would be stronger, it is said. In the South the colored people are acclimated. In the North they are living in an uncongenial clime. There is a high rate of mortality among negroes in the North from consumption and respiratory diseases.

Some of the information which Mr. Lunger secured is contained in the following tables of death rates:—

Nashville, Tenn. 1887 — white, 13.74; colored, 25.43; 1888 — white, 12.38; colored, 23.50; 1889 — white, 12.66; colored, 21.18; 1890 — white, 13.52; colored, 25.03; 1891 — white, 16.17; colored, 27.74.

Atlanta, Ga. 1887 — white, 14.82; colored, 32.13; 1888 — white, 13.13; colored, 35.27; 1889 — white, 12.73; colored, 32.72; 1890 — white, 15.71; colored, 36.28; 1891 — white, 15.25; colored, 34.48.

Memphis, Tenn. 1890 — white, 19.33; colored, 26.15; 1891 — white, 20.02; colored, 28.88.

Charleston, S. C. 1887 — white, 19.89; colored, 40.44; 1888 — white, 17.82; colored, 42.26; 1889 — white, 18.69; colored, 43.98; 1890 — white, 17.76; colored, 36.09; 1891 — white, 19.22; colored, 37.71.

In the year 1891 the vital statistics for the following cities showed this death rate: Richmond — white, 22.34; colored, 29.50; Savannah — white, 20.75; colored, 38.75; Mobile — white, 17.97; colored, 24.25; Anniston — white, 11.75; colored, 20.50; Birmingham — white, 14.85; colored, 26.34; New Orleans — white, 23.97; colored, 35.01.

Mr. Lunger observes that if insurance companies were forced to give the same rate to colored persons that it would necessarily cause a discrimination against the whites, for the increased losses would result in a general rise in rates all around. It would also affect the reciprocal plan of insurance.

"For instance," he says, "Kentucky has an industrial company, and should it open an office in New Jersey for insurance business the law would be operative as to that company in this state, and, therefore, under the reciprocal legislation of Kentucky the New Jersey law would be enforced against the companies of this state doing business in Kentucky."

At the present time the industrial companies give the colored people 66 $\frac{2}{3}$ per cent of the benefit granted to the whites for the same premium, and it is believed that the business on that basis is not as profitable as their business with white people.

PHYSICAL AND MENTAL CONDITION OF CHILDREN.

Results of an Inquiry as to the Physical and Mental Condition of Fifty Thousand Children seen in One Hundred and Six Schools. By Francis Warner, M.D. London. In *Journal of the Royal Statistical Society*, March, 1893.

A few years ago the British Medical Association and the Charity Organization Society promoted an inquiry, through a joint committee,

for the purpose of collecting information concerning the conditions existing among children. Some results of this inquiry have been published by Mr. Francis Warner in the *Journal of the Royal Statistical Society*, for March, 1893, of which the following is an abstract.

The examination of the different children was made chiefly by inspection of their bodies, and indications of brain action. The signs noted were of two kinds: 1st, Points of form, proportion and size in the body and its parts, such as development of the cranium, palate, ears, mouth, etc. 2nd, Nerve signs, as shown by the balance of the head, spine, mobile features, ears, mouth, etc., together with movements of different parts of the body, such as the arms, fingers, eyes, etc. These were taken as signs of the action and condition of the nerve centers producing them. The inspection was conducted by placing the children in ranks and dismissing all who showed no deviation from the normal in the above respects. Those who were abnormal were then reviewed individually and described on a schedule form. This schedule card was divided into four primary columns. The heading of the first column was "development," "physiognomy," and under this were the sub-headings "cranium," "palate," "ear," "growth," etc. These names were ticked if the parts were found to be normal, and the abnormalities were described. The second column was headed "nerve signs" (movements, postures, etc.), with sub-headings "expression," "general balance," etc. In the third column particulars concerning physical health and nutrition were noted, and the fourth column contained the teachers' report of the working power of each child.

Such schedules were filled in for each of the 9186 children noted as presenting some deviation from the normal type. Of these 5579 were boys and 3607 were girls. The following summary shows the general result of tabulation of these children according to the above headings:—

Defects.	Boys.	Girls.	Total.	Percentage to Total Boys.	Percentage to Total Girls.	Percentage to Total.
Development defects...	3,616	2,235	5,851	13.4	9.6	11.6
Nerve defects.....	3,413	2,074	5,487	12.6	8.9	10.9
Nutrition defects....	1,030	973	2,003	3.8	4.2	4.0
Dullness.....	2,216	1,463	3,679	8.2	6.3	7.3

The children represented in this table may be included under one, or even under all, of the headings; and, again, they may be included in at least 250 sub-classes, according to the combination of conditions present. In this table the smaller proportion of defects among girls is noteworthy. In only one class ("nutrition") is the percentage for girls greater than that for boys. The heading "development" includes the greatest number of children, and many of these cases are included also under the other several headings. The correlations of the four groups is shown by the following table:—

Defects.	Defective Development also Present. (Per Cent.)		Nerve Defects also Present. (Per Cent.)		Nutrition Defects also Present. (Per Cent.)		Dullness also Present. (Per Cent.)	
	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.
Development defects.	....	....	54.6	49.0	20.2	32.0	38.3	41.5
Nerve defects.....	57.8	52.8	....	....	18.6	28.8	40.1	42.4
Nutrition defects.....	71.1	74.6	61.6	61.4	....	....	38.1	40.5
Dullness.....	63.0	63.4	61.8	60.1	18.1	27.0	....	...

From this comparison Mr. Warner concludes that "scientific researches of public medicine might well be devoted to the removal of causes of defective development."

Mr. Warner also makes a comparison of the condition of children in regard to social class, nationality, and resident and day schools. He finds that "homes" and "orphanages" present fewer defective cases than do the certified industrial and poor law schools. Ten thousand children in 20 upper class day schools were compared with 26,000 children in 52 day schools of lower social class, with the result that the percentages went against the upper class in all respects.

A comparison of the conditions of children in English, Irish, and Jewish schools yielded some interesting facts. The Irish children appeared to be more defective than were the English. Thirty per cent of the former were noted as abnormal, as against 17 per cent of the latter. The Jewish children were the least defective, only 15 per cent were noted.

Among the "developmental defects" "cranial abnormality" is said to be the most noteworthy. These were divided into three groups, "small heads," "large heads," and "bosses on the cranium."

The last two defects are known to be due to rickets, which is a preventable condition. "Small heads" formed the largest sub-group, and was noticeable as affecting girls more than boys. Also this condition was more common among the poorer classes.

The following facts were demonstrated in regard to cases of "low nutrition":—

1. Girls suffered more than boys.
2. The correlation of low nutrition with development defect was higher for girls than for boys.
3. Low nutrition was less frequent in resident than in day schools.

FREE CHURCH STATISTICS.

Interesting returns have recently been compiled by Rev. W. C. Winslow, D.D., showing the steady growth of free sittings in churches of the Episcopal denomination.

In 1882, of 119 churches and chapels in the diocese of Massachusetts, 60 had free sittings; today, of 195 churches, chapels, and places of worship, 126 have free sittings; so that instead of about half nearly two-thirds of the churches are free. The total number of sittings in all places of worship of this church in Massachusetts is 52,334, of which 30,166 are free and 22,168 are not free. The disproportion of the number of free churches and free sittings in the total is owing to the fact that some of the largest parishes have pewed churches. Trinity Church, Boston, *e. g.*, having 1600 sittings to 400 in a church that is free, like the Church of our Saviour in Longwood.

In 1879, out of about 3000 Episcopal parishes in the whole country, 45 per cent had free sittings; in 1885, out of 3300 parishes, nearly 70 per cent had free sittings.

In Quincy all churches are free; in Arkansas, Florida, and Springfield all but one; in Maine and Nebraska all but two; in Boston, Indiana, Mississippi, and Missouri all but three are free. The summary is as follows: In 52 dioceses, 1 has all the seats free; 8 have 95 per cent and over free; 13 have 90 per cent; 7 have 85 per cent; 5 have 80 per cent; 7 have 70 per cent; 6 have 60 per cent; 4 have 50 per cent; 1 has 29½ per cent; 52 averaging 77½ per cent and over free.

MISCELLANEOUS.

Address upon the Condition of Articulative Teaching in American Schools for the Deaf. By Alexander Graham Bell. Boston, 1893. Pp. 72.

The above address was delivered June 29, 1892, at the summer meeting of the Association to Promote the Teaching of Speech to the Deaf. A detailed statistical report is appended, which is valuable as showing the number of pupils in American schools for the deaf, and also the proportion which is taught speech. The following table summarizes these facts:—

	Total Pupils in Schools.	Percentage Taught Speech.
1884	7,482	27.2
1885	7,801	33.5
1886	8,060	30.8
1887	7,978	32.0
1888	8,372	36.8
1889	8,575	39.7
1890	8,901	41.3
1891	9,232	46.0

From this it will be seen that there has been a marked increase in the number of pupils taught speech.

Proceedings of the Twenty-third Annual Meeting of the National Board of Trades held in Washington, January, 1893. Boston, 1893. Pp. 254.

At the last meeting of the National Board of Trades a vigorous discussion took place in regard to the establishment of a statistical office under the auspices of the National Board of Trade. The idea originated with Mr. Price, who recently died, and was presented anew to the Board by Hon. Carroll D. Wright. It is proposed that this unofficial statistical Bureau should edit and distribute all general information relating to trade, transportation, production, commerce, etc., found in the official reports of this and other countries. In the opinion of Mr. Wright, "the government cannot undertake editorial work or the compilation of foreign statistics in connection and in comparison with its own. This should be done and can only be done by a complete business organization, under the control of the business interests of the whole country." It was suggested that if 1000 affiliated bodies would subscribe \$100 per annum each, the work would be carried on successfully. The discussion covers pages 169–183 of the above report.

AMERICAN STATISTICAL ASSOCIATION.

NEW SERIES, No. 23.

SEPTEMBER, 1893.

MURDERS IN MASSACHUSETTS.*

BY WALDO L. COOK.

The period covered by this inquiry is that of 1871-92, inclusive, or 22 years. I obtained the data from the clerks of the respective county courts, and from the secretary of the Massachusetts Board of Prison Commissioners.

It will be observed that the total number of indictments and the total number of first and second degree cases have been used as separate bases of this investigation.

While the total number of indictments may stand approximately for the total number of persons killed by fellow-creatures during a given period of time, it does not measure satisfactorily the actual strength of the homicidal passion, because in that number are included the cases of defendants adjudged insane, found not guilty, still untried or discharged without a trial, and some other indeterminate factors. On the other hand, it may seem suspicious to appear to have taken no notice of the total number of indictments while confining the base of the inquiry to cases in which verdicts of guilty, either in the first or the second degree, have been rendered. At the risk of unduly complicating this article I

*An article published in the *Springfield Republican*, Feb. 20, 1893, was the nucleus of this article.

have followed out the inquiry in most particulars from the basis of both indictments and first and second degree cases. Both lines of inquiry, I may add, yield conclusions substantially the same.

The following table is a summary of indictments found for murder in all the counties of Massachusetts during the period named; of cases wherein verdicts were found of murder in the first or the second degree; of cases wherein verdicts of manslaughter were found; and of cases wherein the defendants were adjudged insane:—

Counties.	Indictments.	1st Degree.	2nd Degree.	Total of 1st and 2nd Degree.	Manslaughter.	Total of 1st and 2nd Degree and Manslaughter.	Insane.
Barnstable.....	1	....	....	....	....	....	1
Berkshire.....	13	2	3	5	4	9	....
Bristol.....	12	....	4	4	5	9	....
Dukes.....	....	....	....	....	....	....	....
Essex.....	16	1	7	8	1	9	1
Franklin.....	7	....	5	5	1	6	....
Hampden.....	16	3	3	6	4	10	3
Hampshire.....	10	1	3	4	2	6	1
Middlesex.....	27	5	7	12	3	15	1
Nantucket.....	....	....	....	....	....	....	....
Norfolk ..	15	....	4	4	2	6	6
Plymouth.....	6	2	3	5	1	6	....
Suffolk.....	67	5	21	26	13	39	1
Worcester.....	19	2	8	10	1	11	2
Total.....	209	21	68	89	37	126	16

I give the number of defendants adjudged insane without intending to make further use of the figures. The large proportion of insanity cases in Norfolk county is pronounced; and only less so in Hampden county. But the whole number in the state does not seem large enough to give weight to an assertion that the insanity plea can be or has been effectively "worked" on Massachusetts juries. The manslaughter cases do not call for further consideration,

A prominent newspaper published in Indianapolis, in a recent editorial on "The Increase of Homicide and its Cause," made this sweeping assertion:—

Statistics relating to crime indicate an increase of murder and homicide altogether disproportionate to the increase of population during the past ten years. This may be due in part to the probability that better facilities for collecting facts have secured a larger percentage of such crimes in recent years than in earlier times; nevertheless the figures and the crimes that come under the general observer's notice lead to the conclusion that the taking of human life is on the increase.

Such statements as this are not uncommon in current newspaper discussion. The *Chicago Tribune* not long ago published "the annual number of homicides" in the whole United States, in the decade from 1882 to 1891, in this form:—

Years.	Murders.	Years.	Murders.
1882	1,467	1887	2,335
1883	1,697	1888	2,184
1884	1,465	1889	3,567
1885	1,808	1890	4,290
1886	1,499	1891	5,906

That table may or may not be accurate and trustworthy, but its publication in many different journals that have come under the writer's observation indicates an impression prevailing that murders in this country are increasing with an acceleration with which the growth of the population does not keep pace. What are the facts so far as Massachusetts is concerned? To answer that question a table has been prepared, found on the next page.

In this table the twenty-two years have been divided into two periods of eleven years each, and under its respective period has been placed, first, every indictment for murder in Massachusetts, and, second, every case wherein an actual verdict was rendered of murder in the first or the second degree. On the basis of all indictments found it appears that absolutely there were 31 less cases in Massachusetts during the

Counties.	Indictments.			First and Second Degree.		
	1871-1881.	1882-1892.	Total.	1871-1881.	1882-1892.	Total.
Barnstable.....	1	....	1	....	....	....
Berkshire.....	7	6	13	4	1	5
Bristol.....	7	5	12	4	....	4
Dukes.....	....	....	....	....	....	....
Essex.....	2	14	16	1	7	8
Franklin.....	4	3	7	4	1	5
Hampden.....	8	8	16	3	3	6
Hampshire.....	4	6	10	2	2	4
Middlesex.....	13	14	27	6	6	12
Nantucket.....	....	....	....	....	....	....
Norfolk.....	11	4	15	4	....	4
Plymouth.....	4	2	6	3	2	5
Suffolk.....	48	19	67	20	6	26
Worcester.....	11	8	19	5	5	10
Total.....	120	89	209	56	33	89

period 1882-92 than during the period 1871-81, the percentage of decrease being 25.8. In first and second degree cases there was during the second period, comparing it with the first, an absolute decrease of 41.07 per cent throughout the commonwealth. Relative to the great expansion in the state's population, meanwhile, that decrease during the second period of 11 years is seen to be much more pronounced than the figures indicate. Whatever may be the fact concerning the country at large, homicides in Massachusetts have been decreasing rather than increasing.

The decrease that is apt to appear most surprising is that of Suffolk county, which, practically speaking, is the city of Boston with its "slums." During the second period, as compared with the first, there was an absolute decrease of 60.4 per cent in the number of indictments, and an absolute decrease of 70 per cent in first and second degree cases. The showing of the four western counties of Berkshire, Franklin, Hampshire, and Hampden, combined, divides between the two periods as 23 to 23 in indictments, and as 13 to 7, or a decrease of 46.1 per cent, in first and second degree

cases. Taking into account the increase of population, the four western counties show a movement for the better on the basis of the indictments. The increased tendency toward homicide in Essex county during the later period seems an eccentricity that need not detain us. The main point, finally to be noted as the result of this brief analysis, is that Boston with its "slums" and foreign population has progressed, so far as this crime is concerned, with a much greater acceleration than the more sparsely settled region of Western Massachusetts.

The following statistics of Suffolk county, by years, which are worth giving, because of the importance of Boston in such an inquiry, were obtained from the secretary of the Massachusetts state board of prison commissioners:—

SUFFOLK COUNTY BY YEARS.

Years.	Indictments.	1st Degree.	2nd Degree.	Man-slaughter.
1871	1	....	....	....
1872	6	1	....	1
1873	5	....	1	1
1874	10	1	3	1
1875	7	2	....	....
1876	4	....	3	....
1877	3	....	2	1
1878	2	....	2	....
1879	5	....	3	....
1880	3	....	1	2
1881	2	....	1	1
1882	1	....	....	1
1883	1	....	1	....
1884	1	1	....	....
1885	4	....	....	2
1886	....	....	....	....
1887	5	....	1	1
1888	....	....	....	....
1889	....	....	....	....
1890	1	....	....	1
1891	2	....	2	....
1892	4	....	1	1
Total.....	67	5	21	13

I will now analyze the figures for the period of 22 years as a whole with special reference to the relative standing of

the different sections of the state. Inasmuch as populations have to be considered in treating figures based on the ancient and arbitrary county lines of the commonwealth, the following table of populations is inserted : —

Counties.	1870.	1890.
Barnstable.....	32,774	29,172
Berkshire.....	64,826	81,108
Bristol.....	102,886	186,465
Dukes.....	3,787	4,369
Essex.....	200,843	299,095
Franklin.....	32,635	38,610
Hampden.....	78,407	135,713
Hampshire.....	44,388	51,859
Middlesex.....	274,353	431,167
Nantucket.....	4,123	3,268
Norfolk.....	89,443	118,950
Plymouth.....	65,365	92,700
Suffolk.....	270,802	484,780
Worcester.....	192,718	280,787
Total.....	1,457,352	2,238,943

Referring now to the first table the first fact to be disposed of is that Nantucket and Dukes counties, during this whole period, have not had a single indictment for murder. Barnstable has had one indictment which resulted in the defendant being adjudged insane. The three counties have an aggregate population of over 35,000. Including Plymouth, one has a group of counties having a total population of 129,509, in 1890, against which have been charged but seven indictments for murder, or only five first and second degree cases. These four counties are not thickly settled, and their population in a considerable degree engage in maritime pursuits. Their littoral is much more than half of the total littoral of the commonwealth.

Observe now that the five counties of Barnstable, Nantucket, Dukes, Plymouth, and Bristol, the last named containing the manufacturing cities of Fall River and Taunton, and also New Bedford, had in 1890 a total population of

316,074, against which 19 indictments were charged, or nine first and second degree cases. These five counties cover all the territory southeast of the Norfolk county line, which extends from Rhode Island's northeast corner to the Massachusetts Bay.

Consider the western end of the state, namely, the four counties of Berkshire, Hampshire, Franklin, and Hampden. In 1890 they had a total population of 307,290. The record of those four counties compared with the five southeastern counties, which had in 1890 a total population of 316,074, may be seen in the two tables that follow:—

FIVE SOUTHEASTERN COUNTIES.—POPULATION, 316,074 IN 1890.

Counties.	Indictments.	1st Degree.	2nd Degree.	Total 1st and 2nd Degrees.	Manlaughter.	Total 1st and 2nd Degrees and Manlaughter.
Bristol.....	12	....	4	4	5	9
Plymouth.....	6	2	3	5	1	6
Barnstable.....	1	....	....	....	....	....
Dukes.....	....	....	....	....	....	....
Nantucket.....	....	....	....	....	....	....
Total.....	19	2	7	9	6	15

FOUR WESTERN COUNTIES.—POPULATION, 307,290 IN 1890.

Counties.	Indictments.	1st Degree.	2nd Degree.	Total 1st and 2nd Degrees.	Manlaughter.	Total 1st and 2nd Degrees and Manlaughter.
Hampden.....	16	3	3	6	4	10
Berkshire.....	13	2	3	5	4	9
Franklin.....	7	....	5	5	1	6
Hampshire.....	10	1	3	4	2	6
Total.....	46	6	14	20	11	31

These two sections of Massachusetts began the period under consideration with substantially the same aggregate

populations, namely, in 1870, 220,258 for Western Massachusetts, and 208,935 for Southeastern Massachusetts. Southeastern Massachusetts grew faster in population than Western Massachusetts, yet at the close of 1892 one finds that the crime of homicide, speaking in general terms, has been at least 100 per cent the more prevalent in the four western counties.

One may throw these figures of the various counties into a great variety of combinations, and obtain results that appear to the disadvantage of the combined four western counties. Middlesex, for example, will be found with a far better record than the smaller population of the four western counties. So, too, in the case of Essex, which contains the thriving cities of Lawrence, Lynn, and Salem, and which offers a very fair comparison on the basis of population. Even Worcester county, the "heart of the commonwealth," which contains one city of good size, in the comparison shows a balance of crime against the four western counties that is out of proportion to the difference in the populations of the two sections.

The consideration of the statistics of Suffolk county may be said to open the subject of the relation of urban to suburban and rural homicides. The county of Middlesex, which contains Lowell, Cambridge, Somerville, and Malden, as well as a large suburban district of smaller cities, where are the residences of an army of workers in Boston, offers a fair basis of comparison with Suffolk on the basis of population. But the weaker tendency in Middlesex to commit homicide is very marked, having in mind the whole 22 years. Suffolk, with 484,780 population in 1890, has a total of 67 indictments. The four counties of Bristol, Essex, Norfolk, and Middlesex, with 1,036,577 population in 1890, have a combined total of but 70 indictments. Suffolk has a total of 26 first and second degree cases. Bristol, Essex, Norfolk, and Middlesex, with over twice Suffolk's population, have a combined total of 28 first and second degree cases. Those figures

indicate that the tendency to homicide is almost twice as strong in the metropolitan county, or district, as it is in the four surrounding counties above named, which may be said to comprise the great suburban district of Massachusetts.

Leaving out of account the maritime southeastern counties, as being exceptional, one must take the four western counties as best representing in Massachusetts the agricultural or "rural" districts. These four counties can make no such showing as do the four suburban counties referred to in the preceding paragraph when compared with the metropolitan district. In 1890 the population of the four western counties was 63.3 per cent of the population of Suffolk. Now the four western counties have charged against them 46 indictments, or 68.6 per cent of the indictments charged against Suffolk. Even on the basis of indictments the four western counties show a tendency toward homicide that runs the tendency in Suffolk a "stiff" race.

Compare Suffolk with the four western counties on the basis of first and second degree cases alone. The figures are as 26 to 20. While the population of the four western counties is 63.3 per cent of Suffolk's population, the former's total of first and second degree cases is 76.8 per cent of Suffolk's total. When one considers the great differences in the character of urban and rural population the results of this analysis cannot fail to prove of interest. For on this basis one finds certain rural counties having a decidedly stronger tendency toward the homicidal crimes than the metropolitan district.

I will now show how the 28 Massachusetts cities stand in the matter of homicidal tendency as compared with the towns which contain the non-urban population. The following table shows the number of indictments and first and second degree cases charged against each city:—

Cities.	Indictments.	1st and 2nd Degrees.	Cities.	Indictments.	1st and 2nd Degrees.
Boston.....	67	26	Somerville.....	5	2
Salem.....	2	....	Fitchburg.....	1	....
Lowell.....	2	1	Holyoke.....	*6	1
Cambridge.....	2	2	Gloucester.....	1	1
New Bedford.....	1	....	Newton.....	....	....
Worcester.....	2	2	Malden.....	4	2
Lynn.....	1	1	Brockton.....	1	1
Newburyport.....	...	....	Northampton.....	2	....
Springfield.....	2	....	Waltham.....	....	....
Lawrence.....	2	2	Quincy.....	....	....
Fall River.....	8	3	Woburn.....	....	....
Chelsea.....	....	....	Pittsfield.....	....	....
Taunton.....	1	1	Chicopee.....	2	1
Haverill.....	....	....	Marlboro.....	....	....
Total.....	.....	.....	.....	112	46

* Three against one defendant who was adjudged insane.

In 1890 about 70 per cent of the population of the commonwealth was to be found residing in those 28 cities. However, only 53.5 per cent of the total number of indictments, and only 51.6 per cent of the total number of first and second degree cases, are found charged against the cities of Massachusetts. The 30 per cent of the population living outside the cities in 1890 must bear the odium of displaying, during the period of 1871-92, a tendency to homicidal crime nearly equal to that shown by the 70 per cent in the cities. Taken in connection with the results of the analysis of the state by counties, as shown in the preceding pages, it appears already demonstrated that in Massachusetts there is less resistance to the homicidal tendency among the non-urban than among the urban population.

I will now continue my analysis of homicidal crime in the four western counties, comprising that section of the state which is most essentially "rural." One finds first that of all the counties of the state Franklin and Hampshire, in proportion to their population, have the blackest records; and especially so on the basis of the first and second degree cases.

On that basis Franklin, which has not a single town of more than 6000 inhabitants, stands at the very bottom. Hampshire, on this basis, shows up somewhat better than Franklin, having a larger population. The population of Franklin county, it should be observed, has remained almost stationary during the 22 years. In neither Hampshire nor Franklin counties, moreover, is located any of the three largest cities of Western Massachusetts, which are Springfield, Holyoke, and Pittsfield.

Let us now trace the cases of homicide in Western Massachusetts down to the towns and cities themselves. The following tables are summaries of facts which I wish to present in this connection:—

BERKSHIRE COUNTY.—POPULATION, 81,108 IN 1890.

Towns or cities.	Indictments.	1st and 2d Degrees.	Population in 1885.	Population in 1890.	Loss.	Gain.
Adams.....	2	1	8,283	9,213	....	930
Otis.....	1	1	703	583	120	..
Sheffield.....	1	1	2,033	1,954	79	....
Richmond.....	1	....	854	796	58	....
Clarksburg.....	1	1	708	884	....	176
Cheshire.....	2	....	1,448	1,308	140	....
Lenox.....	1	....	2,154	2,889	....	735
Great Barrington.....	1	....	4,471	4,612	....	141
Washington.....	1	1	470	434	36	....
Total.....	11*	5	....	....	....	....

* There is a discrepancy here of two as compared with the total of 13 given in former tables. But in tracing down the indictments I have been unable to locate these two, which were included in the official report of the Secretary of the State Board of Prison Commissioners, but which were not included by the clerk of Berkshire county in his personal report to me, very probably through a mere oversight.

FRANKLIN COUNTY.—POPULATION, 38,610 IN 1890.

Towns or Cities.	Indictments.	1st and 2d Degrees.	Population in 1885.	Population in 1890.	Loss.	Gain.
Shutesbury.....	2	2	485	453	32	....
Coleraine.....	2	2	1,605	1,671	....	66
Deerfield.....	2	1	3,042	2,910	132	....
Montague.....	1	....	5,629	6,296	....	667
Total.....	7	5	....	....	....	....

HAMPSHIRE COUNTY.—POPULATION, 51,859 IN 1890.

Towns or Cities.	Indictments.	1st and 2d Degrees.	Population in 1885.	Population in 1890.	Loss.	Gain.
Hatfield.....	1	....	1,367	1,246	121	....
Pelham.....	2	2	549	486	63	....
Chesterfield.....	1	....	698	608	90	....
Amherst.....	1	1	4,199	4,512	....	313
Enfield.....	1	1	1,010	952	58	....
Easthampton.....	2	....	4,291	4,395	....	104
Northampton.....	2	....	12,896	14,990	....	2,094
Total.....	10	4	.....	.....	....	....

HAMPDEN COUNTY.—POPULATION, 135,713 IN 1890.

Towns or Cities.	Indictments.	1st and 2d Degrees.	Population in 1885.	Population in 1890.	Loss.	Gain.
Westfield.....	1	1	8,961	9,805	....	844
Holyoke.....	6	1	27,896	26,637	....	7,742
Springfield.....	2	....	37,575	44,179	....	6,604
Longmeadow.....	1	....	1,677	2,183	....	506
Southwick.....	1	1	982	914	68	....
West Springfield.....	1	1	4,448	5,077	....	629
Palmer.....	1	1	5,923	6,520	....	597
Chicopee.....	2	1	11,516	14,050	....	2,534
Ludlow.....	1	....	1,649	1,939	....	290
Total.....	16	6	.....	.....	....	....

Twenty towns, of which 12 show a declining population, are charged with 25 indictments, while six cities are charged with 12 indictments. Those 20 towns had a combined population of 36,355 in 1890, while the six cities had a population of 142,211 in 1890. The 20 towns, with about one-quarter as much population as the six cities, have had over twice as many indictments for murder. The six Western Massachusetts cities have had but little more than one-quarter of all the indictments in the four counties, yet their population is nearly one-half of the population of the four western counties. It should be added that the 20 towns referred to above, of which 12 show a declining population, are these: Otis, Shef-

field, Richmond, Clarksburg, Cheshire, Lenox, Great Barrington, Washington, Shutesbury, Coleraine, Deerfield, Montague, Hatfield, Pelham, Chesterfield, Ashfield, Enfield, Easthampton, Ludlow, and Southwick. The six cities are Springfield, Holyoke, Northampton, Chicopee, Pittsfield, and North Adams, the last named being thus classified here because of its population, for it is not really governed under a city charter.

This phase of the subject works out in the same way if we consider only the first and second degree cases. Of the 20 murders of that sort in Western Massachusetts since 1870, 15 were committed in the small rural or "hillside" towns where the churches find it difficult to exist. The five first and second degree murders in Berkshire county were committed in Otis, Sheffield, Clarksburg, Adams, and Washington, and of these towns Otis, Sheffield, and Washington are declining in population. Since 1850, I may add, Otis and Sheffield have each had two bad cases of murder. But, on the other hand, the city of Pittsfield has had none since 1870, and only one since 1850.

In Franklin county the murder cases of the first and second degree have been in Shutesbury, Coleraine, and Deerfield, of which Shutesbury and Coleraine have each had two cases. Shutesbury and Deerfield show a decreasing population, while Coleraine gained but 66 between 1885 and 1890. A more recent Franklin county murder of a flagrant sort, which is not included in this inquiry because it was not disposed of until 1893, was that committed in Wendell by Edward Begor, September 4, 1892. Begor was committed to the state's prison for life for the murder of Abigail Rogers. Wendell is a little town of 505 inhabitants, according to the census of 1890.

The four first and second degree cases in Hampshire county are charged against Pelham, Amherst, and Enfield. Pelham and Enfield both belong to the list of towns that are decreasing in population.

The six cases in Hampden county are charged against Westfield, Holyoke, Southwick, West Springfield, Palmer, and Chicopee. The Holyoke case was as far back as 1874. All of these places, except Southwick, are much larger than the average rural town; but it seems clear that even in Hampden county these cases of violent murder tend to hide away in the more sparsely settled districts. The case in Westfield dates back to 1873, when that town was much smaller than it is now. The case of Wallace W. Holmes, who was hanged, had for its location a very lonely region on the outskirts of Chicopee.

Continuing on the first and second degree basis we find that the nine little way-back towns of Otis, Sheffield, Clarksburg, Washington, Shutesbury, Coleraine, Pelham, Enfield, and Southwick, all of which, except Clarksburg and Coleraine, decreased in population between 1885 and 1890, with a total population in 1890 of 8331, have had 11 of these murder cases since 1870. The four towns of Otis, Washington, Shutesbury, and Pelham, with a total population of 1956, and all of which belong to the list of towns having decreasing populations, have had six of these murder cases during that period. Yet the city of Springfield, with 44,179 inhabitants in 1890, according to the same standard, has not had a single case. The city of Holyoke, with its population of 35,637, and its large proportion of mill operatives, has had but one such case. The six communities of Springfield, Holyoke, Northampton, Chicopee, Pittsfield, and North Adams, with a total population of 142,211, have had altogether but two of these murder cases since 1870. That four little "hill" towns, with only 1956 inhabitants, should have had absolutely three times as many of these first and second degree murders as the six largest municipalities, containing altogether nearly 150,000 souls, is very interesting, to say the least.

I propose now, as briefly as possible, to indicate the character of the first and second degree murders that are charged to these four western counties. By so doing I may succeed

in bringing out interesting or valuable facts in connection with the very strong tendency, comparatively speaking, of the small rural towns to homicidal crime. In order to get this information I have studied the files of the *Springfield Republican*, the accuracy of whose reports can be depended upon.

FRANKLIN COUNTY.

On May 14, 1871, Lyman White shot and killed Calvin Carter at Shutesbury. They were both natives, of American stock, and were cousins. White was 50 years old. His wife had left him 20 years before, because of his ugly disposition, and since then he had lived alone in rural solitude, spending most of his time in hunting and fishing. A grudge had existed between White and Carter for a long time. On the day of the murder they had agreed to be friends again, but after they had parted friends White returned, somewhat intoxicated, yet conscious of his actions, and committed the murder in a perfectly wanton spirit. Afterwards, when told that Carter had died, White declared that he had intended to kill him, and was glad he had succeeded. White was found guilty of murder in the second degree.

On September 7, 1875, Daniel J. Dwight and Herbert A. Davenport, aged 17 and 19 years, respectively, killed Joseph R. Farnsworth, 35 years old, at Coleraine. The weapons were clubs, and the motive was simple robbery. Dwight and Davenport were country boys of native stock, and were regarded as bad characters. Farnsworth lived in a sterile corner of Coleraine called the "Catamount region." "Residents of this vicinity," says the newspaper report of the crime, "are ignorant and poor." The murderers were convicted of murder in the second degree. Concerning Coleraine, a paragraph that appeared in the *Republican*, August 9, 1880, which was probably written by a resident of that town, throws considerable light upon the social conditions there. The paragraph was: —

Coleraine is one of the hill towns which has suffered from the location of railroads at a distance from it. Some 45 or 50 years ago more business was done there than in any other town in Franklin county. It was the center of trade for all adjacent towns, and, to some extent, even the people of Greenfield went there to buy. Six four-horse teams regularly ran to Boston carrying produce and bringing back store goods. Vast quantities of lime were sold, people going 20 miles for it. Now, were it not for the cotton mills, of which there are three, the population would have been diminished at least one half; as it is, it is 400 or more less than it once was.

On August 8, 1880, Nelson J. Phelps, 24 years old, shot and killed Sarah A. Grover, 19, at Shutesbury. The location of the crime was a lonely highway in the woods. It was peculiarly shocking in its details. Miss Grover was Phelps's mistress, and it was just after having had criminal intercourse with her that the young man deliberately, and in cold blood, killed her. In its report of this murder, the *Republican* said:—

The little town of Shutesbury, perched on the eastern hills of Franklin county, which has of late years gained unenviable notoriety through numerous arrests for bigamy and polygamy, now furnishes the lengthening annals of crime in the country places of Western Massachusetts with a shocking murder of a woman and a probable suicide. (Phelps, after killing the girl, had tried unsuccessfully to kill himself.) . . . The cause of the murder was jealousy growing out of the refusal of the woman, who had once left Phelps, to live with him again. Both were Americans, the girl, who is scarcely 19 years old, the daughter of A. J. Grover, a respectable farmer of Turner's Falls, and the man, whose age is 21, more intelligent than most of the northern "poor white trash" to which his associations attach him. . . . If he has any occupation, he is a horse jockey. The affair is a grim commentary upon the boasted purity and uprightness of the old country towns of the state.

The remaining Franklin county case was the murder by Eugene S. Taylor, May 19, 1886, of his two-year-old boy, George. Taylor was a farmer living in Deerfield, under the

shadow of the hills. He had come from Vermont, and was a sober and industrious man. He bought some poison and put it inside some candy which he gave to the delighted child. Then he cut his own throat. The child died and the father lived. Taylor had lived happily with his wife, but he had become despondent and morbid over the hard conditions and ill-fortune of his farming.

These four Franklin county cases display New England rural civilization in the last quarter of the 19th century in as many different aspects. There was the murder by the man who had a grudge, and who had brooded over it for a long time in the solitude of the woods; there was the murder for the sake of money by depraved country boys; there was the murder and attempted suicide caused by unbridled lust of woman; and, finally, there was the murder and attempted self-murder by a man whose mind had evidently become unbalanced through the hard conditions of a small farmer's life on the hillsides of Western Massachusetts.

HAMPSHIRE COUNTY.

Allan J. Adams killed Moses B. Dickinson November 25, 1875. Dickinson was a farmer who lived alone outside Amherst town. Adams came along tramp fashion and was hired by Dickinson to do farm work. The murder was done with an axe, and the motive was robbery. Adams was of native stock, lazy, and of very low type of character. He was a cider drinker. He had a sister in Vermont who wrote a letter saying that Adams was one of six children, all of whom had had fits when children. One brother had hanged himself.

Marion A. Montgomery shot and killed his six-year-old son December 26, 1882, at Pelham. He tried unsuccessfully at the same time to kill his four-year-old daughter. Montgomery was of native stock. He had been living in Kansas. His wife, it appeared, had been guilty of unbecoming conduct with another man, and jealousy and hatred of her in-

flamed the husband to such an extent that he tried to kill the children.

Charles A. Briggs, 21 years old, killed Charles Stetson with a pistol April 12, 1881, also at Pelham. Both were country boys of American stock. Briggs paid attentions to Stetson's wife, who had left her husband. The three met at a "country dance" in a cider mill, to which Briggs had escorted Stetson's wife. There was a quarrel over the woman at the dance, resulting in the murder. Like many country boys of his loose character, Briggs carried a pistol.

Jonathan B. Davis shot and killed Eva Mabel Holden at Enfield, September 20, 1890. This was also a "girl affair." Eva went to a "country dance" with another young man, so Davis waylaid the couple on their way home from the ball in the night and shot them both, killing Miss Holden. Davis claimed that the girl "belonged" to him. Davis was a young American of rather weak mind and sensual, low impulses.

Two of these Hampshire county murders were the outgrowth of the lust for women, with the "country dance" as an accompanying and salient feature. One was caused by the indiscretions of a woman acting upon the jealous, brooding nature of a man. The remaining one was a butchery of an old man, done for robbery, under the easy conditions of rural solitude.

BERKSHIRE COUNTY.

Charles Wood killed Hannah Maria Hazard, September 10, 1876, at Otis. Wood was a young Frenchman, not a native. He was a tramp farm hand, and during a storm found refuge at the isolated farm house of the Hazards, an aged couple. Obeying an impulse to the murder, he picked up an axe, attacked the man, who escaped, and then killed the woman in most brutal fashion.

John Ten Eyck, 46 years old, colored, killed Mr. and Mrs. David Stillman, November 29, 1877, at Sheffield, with an axe. The victims were both over 70 years of age, and they lived

alone in a solitary farm house. The unprovoked butchery was horrible, and after the murder Ten Eyck tried to burn the house. Ten Eyck was born in Connecticut and was reared in Lenox, Mass. He had a quarrelsome disposition, and was something of a jail bird. His occupation was that of farm laborer. Ten Eyck was known as a cider drinker, but was not intoxicated when he committed the crime.

William Montgomery shot and killed George W. Ellis at Adams November 1, 1878. Montgomery was a drinking man, and his ugly temper led him to shoot Ellis because, at a game of cards in his house, Ellis refused to pay for the use of the cards. Montgomery was not intoxicated at the time of the murder, although drink had doubtless affected his temper.

John C. Daily killed James P. Spellman at Clarksburg April 4, 1879, by beating and kicking. Spellman was an old itinerant scissors grinder. Daily quarrelled with him over a job. The latter was a drinking man, and kept a country "hotel" on the state line between Massachusetts and Vermont. The house was very isolated in its location. Daily, judging by his name, was of Irish descent, but there was nothing in the reports of the murder to show that he was not of American birth and rearing.

William Coy killed John Whalen with an axe at Washington August 30, 1891. Coy was a native of Washington, and was employed as a farm hand and railroad track hand. He killed Whalen while the latter slept, then sawed up the dead body and buried it in a lonely spot on the mountain side. The motive was partly robbery, but Coy's wife was prominent in the affair. She had been unfaithful to her husband, and had started to elope with Whalen.

Of these five Berkshire murders three were done in atrocious fashion with an axe, and one was done by beating and kicking. With the exception perhaps of the Adams case, all were committed in the unrestraining environment of rural solitude. The Otis and Sheffield murders of inoffensive old people were different from anything we have met in Franklin

or Hampshire counties, or will meet in Hampden county. But they were peculiarly murders of rural life, where the unbridled passions and ferocious instincts of tramps and ugly laborers of low character find little resistance.

HAMPDEN COUNTY.

Albert H. Smith shot and killed Charles D. Sackett at Westfield November 20, 1872. Smith and Sackett sought the same girl. Smith met Sackett and the girl coming from an entertainment, and out of jealousy killed his rival. Smith was an American.

James Moran killed Stephen F. Lambert, an old man, with stones, near Ashley ponds, on the outskirts of Holyoke, May 8, 1874. Moran was an Irishman, and with some cronies had been carousing. He was "crazy drunk" when he killed Lambert. Moran was an Irishman of low grade.

Joseph B. Loomis, 25 years old, shot and killed David Leavitt, his chum, at Southwick, December 1, 1881. The motive was robbery, and the deed was slyly committed while the two were riding in a carriage. Loomis was the son of a Southwick farmer, and had been rated a "bad boy."

John Daly shot and killed Winslow M. Abbott at West Springfield August 31, 1889, while Abbott was trying to arrest him at his house on a warrant for drunkenness. Daly was an elderly Irishman, a drinker, and a farm hand. He was sober when he shot.

Edward F. Costello, 28 years old, shot and killed his infant son, and tried to kill his wife, at Palmer, June 11, 1890. Costello was an Irishman, and was a railroad hand. There had been domestic troubles which caused jealousy.

Wallace W. Holmes, 50 years old, kicked his wife into insensibility and then buried her alive on the outskirts of Chicopee, in a lonely quarter, in September, 1891. Holmes was a native American with a good war record. He was low and depraved and drank some, but was not drunk at the time of his crime.

These Hampden county murders for the most part were in the larger centres of population. The two most flagrant of them were committed respectively at Southwick and on the outskirts of Chicopee. Even in the comparatively populous Hampden one finds the worst cases of homicide following the line of rural solitude, or of least resistance.

Summarizing briefly the four counties: All the murderers were men, and, with one or two exceptions, were Americans of the older stock. They killed thirteen men, five women, and two children. The method was: By shooting, ten; by beating (with feet, missiles, or clubs), four; by the axe, four; by poison, one. Of the four cases where the axe was used three were in Berkshire county. The more atrocious and flagrant murders were hidden away in the more remote localities, in general following the line of least resistance. The motives were various, of course, but simple desire for butchery and unbridled lust for women appear to have been conspicuous. The motive of robbery is also conspicuous. Only one of these murderers was drunk at the time of the crime.

It is puzzling, perhaps, that the tendency to homicide in remote maritime localities, such as Nantucket, Dukes, and Barnstable counties, should show itself so strong in an opposite direction from that observable in Franklin county. Perhaps the influence of the sea and its pursuits upon the environment should be considered. However, without pausing to amplify that point, it is probable that, in trying to explain the low position of the rural communities of the four western counties, nearly every thinker would make statements substantially like these: The best stock of the old families has been leaving the hillside farms for years and going to the West or to the cities. The least desirable of the old native stock has been left at home. Population has dwindled, and the consequent inter-marriages between relatives have perhaps caused deterioration in many families. Then, again, very many rural towns have been left isolated by the railroads; the churches have grown weak and of little account

as a barrier against social degeneration. The solitude of rural life leaves men more a prey to brooding over real or fancied wrongs or grievances. Finally, the lack of police restraint in small towns allows ample scope to unbridled passions, and to innate ferocity. Perhaps this lack of close police supervision is a very considerable factor in the bad record of the rural Massachusetts district as regards homicide. It would be unwarranted to say that the rural population has a stronger innate tendency to commit murder than the population of the metropolis. Although the figures may be against the rural communities, one must remember that a city like Boston is watchfully guarded day and night by a great police force, which can act the more effectively by reason of the great concentration of the population within a very small territory. However, under present conditions, such a lack of restraint from the law and police officers of society is an unavoidable accompaniment of rural life.

The main conclusions which this inquiry justifies are:—

First, the tendency to homicidal crime has been decreasing in Massachusetts as a whole.

Second, there is less resistance to the homicidal impulse in non-urban communities than in the urban ones. The crime of homicide appears to follow the line of least resistance, and the sparsely settled rural districts, particularly in the four western counties, have the blackest records.

CLASSIFICATION OF OCCUPATIONS IN THE CENSUS.

TRANSLATION OF REPORT MADE BY M. BERTILLON AT THE VIENNA SESSION OF THE INTERNATIONAL INSTITUTE OF STATISTICS; PUBLISHED IN *Bulletin de L'Institut International de Statistique*, VOL. 6, PART I, P. 263.

M. Vannacque and myself submit to your approval three classifications of occupations, the second of which is derived by sub-division from the first, and the third from the second. The chief aim in drawing up this plan has been to secure uniformity in the statistics of occupations.

At present the necessity of uniformity in statistics of labor is strongly insisted upon. The study of the organization of labor is assuming a steadily advancing position in government inquiry. As progress is made in this study the stronger becomes the conviction that in order to attain practical results a certain international agreement is indispensable. How can this agreement be hoped for if the elements of statistics, which form the basis of it, are not comparable. The work which we are undertaking, therefore, does not aim simply at satisfying the curiosity of the learned; it has a more important bearing, and may help to solve most serious problems, which may be presented in a few years to all governments.

If it were proposed to adopt a single classification, some countries would not coöperate, thinking it too complex, while others would consider it too short. This difficulty is avoided by proposing three classifications, which blend together in some measure, since each is developed by the sub-division of the preceding.

The first of the classifications is very condensed, numbering only 65 headings. The second reproduces certain of these general headings, and develops from them a great many others, numbering 197 headings. Finally, the third develops these still further, and contains 456 categories.

But there is no reason for limiting our choice to these three classifications. The uniformity of statistics of occupations

will in no way be altered; if, for example, a country should adopt the second classification, and substitute for some of its headings the corresponding ones of the first or third classification. It is important, however, that the general frame work should always be that of the first classification, the most condensed of the three, and that the occupations should be arranged according to the third classification, the most detailed of the three.

GENERAL PRINCIPLES OF THE PROPOSED CLASSIFICATION.

The general principles of the proposed classification have already been set forth in a preliminary article presented before the International Statistical Institute, at its session at Paris in 1889. We will summarize these briefly.

If the different classifications actually in use are compared, it is evident that they agree well enough in the general divisions to be adopted. They can be made almost uniform by accepting the following grand divisions of occupations:—

- A. Production of raw materials :
 - I. Agriculture.
 - II. Extraction of minerals.
- B. Transformation and employment of raw materials :
 - III. Manufacture.
 - IV. Transportation.
 - V. Trade.
- C. Public administration and the liberal arts :
 - VI. Public force.
 - VII. Public administration.
 - VIII. Liberal professions.
 - IX. Persons living on their income.
- D. Miscellaneous.
 - X. Miscellaneous and non-classified.

These divisions are so logical that there is scarcely need to justify them.

- A. Man procures raw materials necessary for every occu-

pation, either by working upon the soil (I. Agriculture), or by working under the soil (II. Extraction of minerals).

B. These raw materials are then changed by the arts and manufactures (III. Manufactures), carried to the place where they are needed (IV. Transportation), and distributed among consumers by trade (V. Trade).

C. To keep good order and guard the welfare of the preceding occupations, every country has an army and a police force (VI), and a public administration (VII). The liberal professions (VIII) and persons living upon their income (IX) naturally follow the occupations just reviewed.

D. Finally, it is expedient to establish a division for persons without occupations and the non-classified (X).

The occupations in each of the above ten classes are then sub-divided as follows : —

I. Agriculture.—The following divisions are borrowed from the Italian classification : —

1. Cultivation of arable land.
2. Gardening and market gardening (nursery-men, mushroom raisers).
3. Forestry (foresters, wood-cutters, charcoal-burners).
4. Stock-raising (horses, cattle, sheep, goats, swine, dogs, poultry).¹
5. Raising of small animals (ornamental birds, fish, oysters, bees, silk-worms).²
6. Fresh-water fish and game. (The fresh-water fish are placed under this heading as it is often difficult in practice to distinguish coast fishermen from other sailors, and they are therefore united under the same head.)

II. Extraction of minerals.—This class is nearly always divided into three categories.

1. Mines. First, mines of combustible minerals, then of metals. Both lists may be modified according to the country.
2. Quarries. First, of stone and other hard rocks, then of sand and soft rock. Both lists may be modified according to the country.

¹The animals are arranged according to size. The three kinds producing milk are placed together. ²According to size.

3. Salt mines and marshes. A special division is provided for other substances taken from water, such as borax, etc.

III. Manufactures and allied industries.—In most classifications industries are designated either by the substance utilized, or by the need they satisfy. Thus, on the one hand, there are industries in metals, skins and hides, wood, etc.; and, on the other, those of dress, food, furniture, buildings, etc.

In all classifications of merchandise, and notably in those of the custom house, two categories are distinguishable:—

1. Articles necessary to manufacture, as crude materials, or those partly worked up, whose final use is not exactly determined, as iron in pigs or bars, thread, etc.
2. Manufactured articles whose use is determined, as a piece of furniture, a garment, etc.

In general, articles necessary for manufacture being either crude materials, or partly worked up, consist of a homogeneous substance, such as sawed wood, tanned skins, etc. It is natural, therefore, to arrange the industries related to them under headings of the names of the substances with which they are concerned, as, *e. g.*, industries of metals, leather, wood, etc.

Manufactured articles, on the contrary, usually consist of various substances. An arm-chair is made of wood, hair, wool, metal springs, and leather or tapestry. It is impossible, therefore, to classify makers of arm-chairs under industries of wood, iron, or woven fabrics, etc. But as the use of manufactured articles is well determined, they are naturally classed according to their use, and distinguished as industries of dress, furniture, building, etc.

From the preceding considerations, industries may be divided according to the following generally received categories:¹—

¹ Although the order of arranging these headings is only of secondary interest, we wish to justify it in a few words. It is the order followed above for the production of raw materials. First, we arrange the industries for which the raw material is furnished by agriculture (textile substances, woods, skins); then those for which the material is furnished by mines and quarries (metals, clay, and sand); then the chemical products which

Industries Classified According to Material Used.

1. Textiles.
2. Skins, hides, hard matter from the animal kingdom (bone, horn, pearl shell).
3. Wood.
4. Metallurgy.
5. Ceramics.
6. Chemical products, properly speaking, and analogous products.

Industries Classified According to the Needs to which they are Applied.

7. Food stuffs.
8. Clothing and the toilet.
9. Furnishings.
10. Building.
11. Construction of apparatus for transportation.
12. Production and transmission of physical forces (heat, light, electricity, motive power, etc.).
13. Industries of luxury ; industries relating to the sciences, letters, and arts.
14. Industries concerned with refuse matter.

Non-Classified Industries.

15. Other industries.
16. Industries insufficiently determined.

TEXTILES.

All classifications agree upon the definition of this heading. It is applied to the manufacture and coloring of woven goods, and not their utilization for garments and furniture. Thus, tailors, sempsters, etc., ought not to be classed in this division.

borrow from the three kingdoms the necessary raw materials. Finally, the industries classified according to the need they fulfill are arranged in the following order: Food, the most important of our needs, should still more be put first, since agriculture furnishes the raw materials for it. Dress gets its raw materials from industries of woven goods, and of skins, which are enumerated among the first. Furniture and building (which concern us not much less than dress) get their raw materials from wood, metals, and ceramics. The apparatus of transportation and production of physical forces are less indispensable to man than the preceding industries. Finally come the industries of luxury and those pertaining to the sciences, letters, and arts. Naturally, industries of refuse matter are named last.

In the second classification are included all substances susceptible of being woven (cotton, flax and hemp, etc.). Then in the further details of the third classification are distinguished (1) the preparation of the substance employed, as, for example, the retting of flax and hemp; (2) spinning; (3) weaving under the principal varieties.

The working up of straw is regarded as a textile industry, but the manufacture of straw hats and baskets, etc., can hardly be considered as textile. A special heading is reserved for mixed fabrics, whose importance is constantly increasing. A special heading is provided for laces, tulles, etc., because these fabrics can be manufactured with the most varied materials. Industries of hair and horse-hair are better classed with textiles than with skins and leathers. Felt is also a sort of tissue. The tissues of horse-hair, properly speaking, constitute an important industry. The feather industry is also classed here, since, belonging at the same time to the industry of clothing, and that of furniture, it cannot be classed with either of these. The feather industry is better placed with textiles, and the weaving of feathers is becoming quite extensive.

Finally, a special heading is reserved for the dyeing and printing of fabrics. Naturally, the dyers and cleaners (*Teinturiers-dégraisseurs*) do not find their place here; they are classed under the industries of dress and the toilet.

SKINS, HIDES, AND HARD MATTER FROM THE ANIMAL KINGDOM. (BONES, HORNS, PEARL SHELL, ETC.)

This rubric includes the preparation of leather (either by tanning, alum, or other process), and the principal treatment to which it is subjected (stamping, moulding, gilding, silver-plating, or leather). The industry of furriers, gut-workers (gold-beaters' skin, catgut), and, finally, that of hard matters from the animal kingdom (bone, ivory, shell, whale-bone, pearl-shell) are naturally placed in this division. On the contrary, cord-wainers, who are inseparable from shoemakers,

galosh-makers, and other makers of foot-wear (slippers, etc.), and take part, like them, in the industry of dress, are not included at this point. Glove and breeches-makers are always classed with the industries of dress. Saddlers and harness-makers use other materials than leather (now horses' collars are made of iron solely), and cannot be classed here. These will be found under "Means of transportation."

WOOD.

The first occupation indicated in this group is that of sawing, since this prepares the wood for the other industries. Then we enumerate occupations using wood exclusively. A separate special division is reserved for wood-turners, for, as workmen of this occupation use the lathe, there is a tendency in every language to designate them by the very vague word "turner," without specifying whether they turn on wood, metal, or other substance. Therefore, even at the risk that this list may be incomplete, it is better to put them apart. In this way, at least, one can always get at the total number of turners.

To industries of wood are added those of wicker, cork, and other woody materials (excluding straw, rushes, and other substances classed with textile). The "*Modelleurs en bois pour machine*" belong evidently to the metallurgical industry. Carpenters, joiners, and floor-layers are classed with building industries in all classifications, and notably in the English. Shoemakers plainly form a part of the industry of clothing, and could hardly be separated from galosh-makers, who use leather quite as much as wood. Cane-makers cannot be separated from makers of parasols and umbrellas, who use cloth, whale-bone, and metal as well as wood. These are placed under the heading "Dress." Wood-carvers and inlay-ers are only specialists in cabinet-making, and with them should form a part of the industry of furnishings. Finally, wheelrights, inseparable from carriage-makers, and builders of wooden boats, inseparable from other boat-builders, come under the industry of "Means of transportation."

METALLURGY.

Under this head are arranged : —

- (a) Forging and rolling of metals, the list varying according to the country.
- (b) Forging of metal articles.

In enumerating industries concerned with making metal articles we follow this order: (1) Industries which work up principally or exclusively iron, and these are subdivided into two groups, according to whether they make machines and large implements or small articles; (2) Industries working principally or exclusively on copper, lead, tin, or other metals; (3) Metallurgical industries characterized less by the substance they work up than by the instruments they use, as *étameurs ferblantiers*, the turners on metal, the wire-drawers, followed by the industries using metallic wire exclusively, and, lastly, stampers.

Lock-smiths and plumbers are not classed under metallurgical industries, for it is impossible to separate them from building industries. It is thought best to class the makers of brass and iron beds under the heading "Furniture." Goldsmiths and gold-beaters are inseparable from jewellers, lapidaries, workers in real and imitation jewels; and all these industries have been classed under industries of luxury. In the same way it is difficult in practice to distinguish watch and clock makers from jewellers.

CERAMICS.

Ceramics comprise industries of glass, porcelain and crockery, and common clay (bricks, tiles, etc.).

CHEMICAL PRODUCTS, PROPERLY SPEAKING, AND ANALOGOUS PRODUCTS.

The classification of the very numerous occupations comprised in this group is very difficult. These are distinguished according to the nature of the commodity treated, thus : —

1. Manufacture of pure chemical products.
2. Manufacture of dyes and inks.
3. Industries concerned with fatty and analogous bodies, as fats and other soft substances taken from the bodies of animals (flesh and hides excepted), vegetable and mineral oils.
4. Manufacture of bodies derived from fats (candles, soap, etc.).
5. Industries relating to various impermeable commodities, arranged under the following headings: Varnishes and wax, India rubber, bitumen, tar, resin, etc.
6. Paper industries¹, which naturally take their place² in the group of chemical and analogous products, and which cannot be classified elsewhere.

It is impossible to put paper with leather, as is done in the German nomenclature, so excellent in so many other respects, for there is no relation between these industries. The production of the raw materials, the kind of work of which they are the object, their final use, and, finally, the degree of healthfulness in the respective industries, tend to separate them.

Sugar refineries, distilleries, manufactories of vinegar, mustard, etc., are classed under the heading "Foods."

FOODS.

These are divided into cereals, different products of the animal kingdom, other products of the vegetable kingdom, and, lastly, drinks.

Restaurants are inseparable from wine shops, cafés, and lodging houses, and should consequently be classed under trade.

The servants attached to restaurants naturally follow the same placing; domestic cooks, male and female (difficult to distinguish from the preceding), form a separate list in the group of domestics.

¹ Excepting book-binders, who are found among the industries relating to science and letters.

² They were so classified by the *Chambre des Prudhommes de Paris*.

Grocers are considered as merchants, and not as industrials.

In this list are also classed manufacturers of tobacco. Tobacco cannot be classified elsewhere, and may consequently be reckoned as a food.

DRESS AND THE TOILET.

Besides the industries of clothing, properly so called, this list contains some accessory industries pertaining to neatness of dress and the toilet. Such are the dyers and cleaners, bleachers, bath-keepers, and, finally, barbers and hair-dressers.

FURNITURE.

Here are classed the cabinet-makers, who make the furniture; and the carvers, inlayers, and other workmen who work for its ornamentation. To the furniture varnishers are added carriage painters, who do exactly the same work. Finally come the mirror-makers and upholsterers.

Just as we add the industries which pertain to the neatness of clothing to the industries of clothing, so we join to the furniture industries the scrubbers, waiters, and waitresses who clean the furniture. It is necessary to devote a special heading to the large number of persons who carry on this work.

BUILDING.

The numerous building industries are arranged according to the nature of the raw material they employed. First, those who work in earth, plaster, and stone; then those who use wood; and, lastly, house painting and painted-paper manufacture. The order is explained thus: After enumerating lime kilns, plaster kilns, etc., which prepare the raw material for every kind of construction, we enumerate the building industries in the order in which they co-operate in the building of a house. First, the excavators dig up the soil for the construction of the foundations; then the masons and stone-cutters build the heavy work; next the roofers, zinc-workers, plumbers, and other workmen in metals put on the

roofing and finish the building; and, finally, the carpenters, floor-layers, and house painters carry out the work of arranging and ornamenting the interiors.

Means of transportation does not include either buildings or furniture, and should therefore have a special place.

Clock-smiths only form a specialty in lock-smiths' work, and should therefore be counted as lock-smiths. In the same manner carriage painters do the same kind of work as furniture and piano varnishers. These are, strictly speaking, cabinet-makers, and should be counted as such.

PRODUCTION AND TRANSMISSION OF PHYSICAL FORCES (HEAT, LIGHT, ELECTRICITY, MOTIVE POWER, ETC.).

In all large cities there have recently been erected considerable works for distributing electricity, transforming it into light or motive power. Others distribute compressed air. They are planning at Paris to distribute warm water in the same manner. These industries are being developed so rapidly that we have decided to provide a special heading.

Under this heading manufactures of gas and ice, whose connection with the preceding is evident, are also enumerated.

INDUSTRIES OF LUXURY.

Here are placed industries devoted to the precious metals and gems; then the toy trade, or the making of children's playthings, and of the many small articles of various kinds which the French merchants class together under the name of *Articles de Paris* (fans, sun-shades, tobacco-pouches, pocket-books of various kinds, etc.).

INDUSTRIES PERTAINING TO THE SCIENCES, LETTERS, AND ARTS.

Here are placed the polygraphic industries: printers, lithographers, photgraveurs, book-stitchers, and book-binders. We do not include in polygraphic industries the manufacture of

paper, which is inseparable from the manufacture of paste-board and celluloid. It is plain that these last have nothing in common with the polygraphic industries.

INDUSTRIES PERTAINING TO REFUSES.

Here are included rag gatherers and night-men.

OTHER INDUSTRIES.

This heading provides elasticity, and allows for any omission which, in spite of care, may occur.

INDUSTRIES NOT WELL DETERMINED.

Many persons think that they designate their occupations exactly by calling themselves "maker" or "manufacturer," without adding what they make. Others, still more numerous, call themselves "laborers"; and frequently, indeed, they have no other way of designating themselves. These are persons who have no regular occupation, and live from day to day by different kinds of labor which needs no apprenticeship, and to these it seems best to devote a special heading.

IV. TRANSPORTATION.

We distinguish between maritime and fresh-water navigation, transportation by streets, roads, and railroads. Just as we place under the heading "Railroads" the workmen who repair the road, as well as those who manage the trains, so we place under the heading "Transportation by streets and roads" the workmen who repair the streets and roads. In the same way, under the heading "Transportation by canals and rivers," we include those who repair these means of communication. So, also, under the heading "Maritime transportation" we place the agents who see to the maintenance of harbors, light-houses, and semiphores. It has already been pointed out that the practical difficulty of distinguishing between sailors on fishing boats and those on transportation

vessels obliges us to class under this heading the marine fishermen.

Posts and telegraphs are naturally placed under the industry of transportation.

V. COMMERCE.

Here is encountered a serious difficulty. Almost all industrial products demand two distinct categories of individuals: Manufacturers and merchants. These two classes are different from every point of view, and, nevertheless, in the current language of all nations they bear the same name. The man who sells us a hat is not the man who made it, and yet both are called "hatters." At the census taking both the manufacturer and the merchant will claim the same occupation, and both will believe that they have answered accurately the question put to them. What, then, shall the census-taker do when he has in his hands the official record of a "hatter"? Shall he consider him as a manufacturer, or as a merchant simply?

The excellent English nomenclature has answered it by suppressing entirely the distinction between manufacturers and merchants. Most of its headings are reduced to this model: "Persons working and dealing in tobacco and pipes," or, again, "House and shop-fittings maker, dealer." It is, indeed, very difficult to avoid this confusion, but it is a thing much to be regretted. Science has need of distinguishing between manufacturers and dealers. They are different from every point of view, as in the nature of their occupations; the influence which they may have upon health, the kind of instruction which they have; their very manner of thinking and acting are entirely different; their interests are often antagonistic. One could doubtless distinguish them by adding to the census list a supplementary question which might be reduced to something like this: Is the above mentioned a manufacturer or merchant? This supplementary question would perhaps do away with the difficulty referred

to. We are unable to decide whether to unite manufacture and commerce, but we have considered the confusions which might arise. With the aim of avoiding the difficulty, there are introduced among commercial occupations the same abstract divisions as among the industrial occupations. As we distinguish industries of metals, skins, furniture, etc., so we distinguish trades in metals, skins, furniture, etc. In this way the confusions which might arise between industry and trade would have much less inconvenience, since one would always have the possibility of adding the manufacturers to the merchants, who sell the same products¹.

Moreover, if manufactures could be sufficiently distinguished from trade, there would be the advantage of comparing the number of those who make a certain class of products with the number of those who limit themselves to retailing them.

These motives led our Austrian colleagues, who were recasting their classification at the time we were elaborating ours, to follow the same methods, and to introduce, as we propose to do, the same abstract divisions among trading occupations as among the industrial. In addition, there are added certain lists for merchants who carry on all sorts of trade at once, and who particularly are so numerous in country towns.

¹ It is important to distinguish clearly between Manufacture and Commerce. This is what we propose :—

Definition of Manufacturer.—Any person making any products whatsoever (either by means of raw materials or manufactured products), or attached in any manner whatever to their manufacture, should be considered as a manufacturer, and classed in the list comprised under the heading "Manufacture."

A person who is both manufacturer and merchant should be classed as a manufacturer.

Persons carrying on industries having for their principal aim the maintenance, repair, or establishment of articles already manufactured, should be considered as manufacturers. Thus, a mender of broken china is considered as a manufacturer. A dealer in umbrellas, who repairs broken umbrellas, is considered as a manufacturer, although he often calls himself an umbrella merchant. On the whole, the word manufacturer, or *industriel*, is taken in its broadest sense. Thus it will happen that, when one does not know exactly whether a person is a manufacturer or a merchant, it will be necessary usually to class him as a manufacturer (*industriel*).

Definition of Merchant.—Every person who is principally concerned with selling articles manufactured by others, and who does not submit them to any elaboration, should be considered as a merchant, and should be classed in the list entitled "Trade."

One who does not sell but rents (for example, a livery stable keeper) is considered as carrying on a trading occupation, and termed a merchant.

Finally, we have reserved certain headings for those who designate themselves as "merchant" (*negociant*) or "employee of trade" without defining the trade they are engaged in.

VI-IX. PUBLIC ADMINISTRATION AND THE LIBERAL ARTS.

There is little explanation to be given about this part of our nomenclature; it is copied, or very nearly so, from the usual classifications, which all resemble each other.

Under Public Administration there should be classed only those officers who are not comprised under any other rubric. Thus, the officials of post-offices would not be comprised under the head "Administration." If we adopt a different plan, we would be liable to find an abnormal number of officers in countries where, for example, railroads belong mostly to the government.

Veterinary surgeons are classed in the medical profession, and we do not think that we have done them too much honor, considering the great advances which their art has made in medical science. It is necessary to distinguish, as far as possible, professors in institutions of instruction maintained by the government from those teaching in private institutions or in families. Many persons, indeed, not having succeeded in any of the liberal arts, call themselves private teachers, without having any right to that title. Private instruction is one of those occupations which our colleague, Mr. Ogle, calls the "*professions refuges*." On the contrary, all professors of public instruction are carrying on the really noble occupation of educators.

We class among the artists designers for the industrial arts, or who make designs for painted papers, or for printing upon fabrics, or for decorating ceramics, etc. A special list is included for persons who think they are answering the question put by the census in calling themselves by a title or honorable distinction, as, for example, deputy, alderman, or burgomaster, etc., or by a diploma without any immediate professional utility, or by a designation indicating solely

the social position, as in England, *esquire*; in Germany, *bürger* or *privat*, etc. Though these could be classified under the list "Occupation Unknown," it is advisable to use the rudimentary information which they give about their social position.

Under this same heading should be classed persons who give an occupation they no longer pursued, such as *ancien notaire*, when they bear no right to such a term.

X. MISCELLANEOUS.

Here are classed domestics, who could not be placed under any other class of occupations, unproductive individuals, and, lastly, persons whose occupation is unknown.

Among domestics it is necessary to provide special headings for cooks and coachmen, because it is very difficult, in practice, to distinguish domestic cooks from those who carry on the same occupation as a business, as cooks in restaurants, coachmen at livery stables. If we are careful to give special headings, it will always be possible to know at least the total number of cooks and coachmen.

Unproductive persons may be either simply unoccupied, temporarily or permanently, or else incapable of producing. This incapacity for production is temporary when it is due to youthful age, such as, for example, that of children or school pupils, etc.; but it is most often permanent, and constitutes for society a burden with no compensation, when it is due to a state of incurable malady, or of immorality. These considerations will doubtless justify the order in which we have arranged the different categories of unproductive individuals.

CLASSIFICATION OF UNPRODUCTIVE INDIVIDUALS.

Unoccupied.	{	Temporarily.	{	447. Persons temporarily without employment.
		Permanently.		448. Persons with no regular occupation.

Incapacity for work.	{	Temporary. . .	{	449. Children without occupation.
			{	450. School children.
				451. Students.
	{	Constituting a burden to society without compensation.		452. Sick persons and hospital inmates.
				453. Insane persons.
				454. Prisoners.
				455. Beggars, vagrants, and prostitutes.

Distinctions to be Established in Each Occupation.

It remains now to select the categories and distinctions to be established in each occupation. In no country are they so numerous or well chosen as in Germany. Unfortunately, all countries do not expend for the occupation classification as large an amount of money as Germany devoted to its census of occupations for 1882.

In every occupation it is necessary to distinguish sex. There is no country, indeed, which does not make this distinction.

In many countries we can distinguish at least two categories in each occupation: (1) Those who work in their own interest; (2) those who work in the interest of others.

This distinction is very important. In England, for example, we can go still further in this direction and make two sub-divisions in each of these two categories. Among those who work in their own interest we may distinguish (*a*) employers, properly so-called; (*b*) sub-employers, contractors, and others,—that is, persons to whom the chief contractor furnishes the raw material or the capital, and who, themselves becoming sub-contractors, engage workmen, and make them do the work.

Among those who work in the interests of others we can distinguish (*a*) the employes (*employés*); (*b*) the laborers (*ouvriers*). These four categories are separated in the German statistics. The sex is naturally distinguished in each of these. Thus, each of the 153 occupations included in the German classification is divided into eight categories, and

these eight sub-divisions will be found in almost all tables considered.

It is important to determine what one means by a workman. A workman who carries on any other occupation than that of his employer evidently should be classed in the rubric which concerns him and not in that which concerns his employer. For example, a carpenter employed in crockery works should be considered as a carpenter, though his employer is classed as a manufacturer of crockery.

There is another important distinction to be noted, especially in countries where people are occupied in caring for the families of workmen. In each of the eight categories of which we have just spoken Germany shows the number of members of family without special occupation (separating those less than fourteen years from those of fourteen years), and domestics attached to the person. (*Argehörige ohne Erwerbsthätigkeit im Hauptberuf.*) The French census in 1886 undertook this inquiry, and following censuses have continued the work. In England these distinctions are not needed; the members of the family without occupation are counted in the list "No Occupation." It is however very important to attach to the occupation considered all those who live upon it indirectly. Above all, if we distinguish the family of the employer from the family of the employes and workmen, we can show the extent of the burdens of family which weigh upon these three classes of persons.

Finally, there is another piece of information of great importance, namely, the age of the persons who are carrying on each occupation. This distinction is of great interest from all points of view. It enables us to establish mortality rates of occupation, and aids in establishing insurance and sick funds. England has the great merit of having always distinguished in the ages of the individuals of each occupation. Switzerland has done the same under the direction of M. Kummer. In France I have introduced the same distinction for the city of Paris in the last two censuses, and the

Minister of Commerce has adopted it for the census which is now being taken. Germany likewise adopted it for the census of 1882. Large groups of ages, as groups of ten years, and even twenty years, will suffice. The four kinds of distinctions which we have just indicated — age, sex, position of employer and employe in his occupation, and the enumeration of the members of the family living indirectly upon the occupation without carrying it on themselves — appear to us so important that a census of occupation should never fail to present them.

The German census furnishes many other very interesting points about each occupation, but none more so than the preceding. It distinguishes carefully between the principal occupation (the only one taken into account in most countries) and the accessory one (*Hauptberuf* and *Nebenberuf*). It distinguishes for each occupation and sub-division of occupations the number of those carrying on the designated occupation as their only one from those who have an accessory occupation, with an abstract indication of that accessory occupation; and, lastly, the number of those who only carry on the occupation designated as an accessory, and who have, besides, a principal occupation, with summarized statement of that occupation.

The following resolutions are offered: —

I. That the International Statistical Institute attaches great importance to classifying the census of occupations in different countries upon some common basis of comparison.

II. That it should present for adoption by statistical bureaus the three classifications accompanying this. It is to be observed that each is a development of the preceding, and that for one of the rubrics its further development may be conveniently substituted.

The statistical bureau should distinguish in each occupation: 1. The employers, employes, laborers; 2. Members of the family without special occupation, who live at the expense of one of the above three categories of workmen; 3 and 4. For each category given, the sex and age.

B. DETAILED SCHEME OF THE THREE NOMENCLATURES PROPOSED.

I. AGRICULTURE.

1st Classification.	2nd Classification.	3rd Classification.
1. CULTIVATION OF ARABLE LAND.	1. <i>Cultivation of arable land.</i>	1. Landowners cultivating their own land. 2. Farmers, <i>mitayers</i> , cultivators. 3. Laborers, farm servants, etc.
2. GARDENING AND MARKET-GARDENING.	2. <i>Gardening and market-gardening.</i>	4. Horticulturists, market-gardeners. 5. Nursery-men. 6. Mushroom raisers.
3. FORESTRY.	3. <i>Forestry.</i>	7. Woodmen. 8. Wood cutters, faggot makers, charcoal burners.
4. RAISING OF FARM STOCK.	4. <i>Raising of farm stock.</i>	9. Raising of horses. 10. " " cattle. 11. " " sheep. 12. " " goats. 13. " " hogs. 14. " " dogs. 15. " " poultry.
5. RAISING OF SMALL ANIMALS.	5. <i>Raising of small animals.</i>	16. " " ornamental birds. 17. " " fish. 18. " " oysters. 19. " " bees. 20. " " silk-worms. 21. " " other small animals.
6. FRESH-WATER FISH AND GAME.	6. <i>Fresh-water fish and game.</i>	22. Fresh-water fish. 23. Game. 24. Destroyers of harmful animals.

II. EXTRACTION OF MINERALS.

1st Classification.	2nd Classification.	3rd Classification.
7. MINES.	7. <i>Mines of combustible materials.</i>	25. Coal. 26. Anthracite. 27. Lignite. 28. Peat. 29. Petroleum.
	8. <i>Mines of metallic ores.</i>	30. Iron mines. 31. Copper " 32. Zinc "

II. EXTRACTION OF MINERALS.—Continued.

1st Classification.	2nd Classification.	3rd Classification.
7. MINES.— Continued.	8. <i>Mines of metallic Ores.— Continued.</i>	33. Tin mines. 34. Nickel mines. 35. Antimony " 36. Mercury " 37. Other common metals. 38. Gold mines. 39. Silver " 40. Lead " (argentiferous or not). 41. Platinum mines. 42. Other precious metals.
8. QUARRIES.	9. <i>Quarries of hard rock (stone, bitumen, cement, etc.</i>	43. Granite quarries ¹ . 44. Diamond and precious stones. 45. Stone quarries ² . 46. Marble " ³ . 47. Sandstone quarries ⁴ . 48. Slate " ⁵ . 49. Plaster " ⁶ . 50. Lime " ⁷ . 51. Bitumen " 52. Cement " ⁸ .
	10. <i>Quarries of soft rock (sand, etc.).</i>	53. Sand " ⁹ . 54. Clay " 55. China clay "
9. SALT MINES, ETC.	11. <i>Rock salt and salt from marshes.</i>	56. Rock salt and salt from marshes.
	12. <i>Extraction of other sub- stances in solution.</i>	57. Extraction of other substances in solution.

III. MANUFACTURE.

1st Classification.	2nd Classification.	3rd Classification.
10. TEXTILES.	13. <i>Cotton.</i>	58. Spinning. 59. Weaving. 60. Knitting. 61. Cotton-wool making. 62. Other cotton industries.
	14. <i>Flax and hemp.</i>	63. Flax and hemp retting; making of tow. 64. Flax and hemp spinning. 65. Flax and hemp weaving. 66. Other flax and hemp manufac- tures.

NOTE.—Excluding: ¹ Makers of slabs, 296; ² Stone cutters, 296; ³ Marble cutters, 297; ⁴ Sandstone cutters, 296; ⁵ Slate cutters, 296; ⁶ Plaster kilns, 293; ⁷ Lime kilns, 293; ⁸ Cement kilns, 293; ⁹ Brick makers, etc., 209.

III. MANUFACTURE.—Continued.

1st Classification.	2nd Classification.	3rd Classification.
10. TEXTILES.— Continued.	15. <i>Straw.</i> ¹	67. Common straw (baskets, mats, etc.).
	16. <i>Other textiles of vegetable origin.</i>	68. Fine straw (hats, trimmings).
		69. Ramie.
		70. Jute.
		71. Cocoa.
	17. <i>Rope manufacture.</i>	72. Aloes.
		73. Couch-grass.
		74. Alfa.
		75. Miscellaneous (net matting).
	18. <i>Wool.</i>	76. Twine.
		77. Thread.
		78. Rope, cordage.
		79. Preparation of the wool.
	19. <i>Silk.</i>	80. Spinning.
		81. Weaving.
		82. Knitting.
		83. Carpet weaving.
	20. <i>Mixed webs.</i> ²	84. Menders and repairers of carpets, tapestry, shawls, and other woollen stuffs.
		85. Other woollen industries.
		86. Drying and winding of cocoons.
		87. Spinning.
	21. <i>Laces, tulle, blond-lace, crêpes, etc.</i>	88. Weaving.
		89. Plush and velvet.
		90. Other silk industries.
		91. Mixed webs.
	22. <i>Passementerie.</i>	92. Laces.
		93. Tulle.
		94. Blondes.
		95. Crapes.
	23. <i>Hair and horse hair.</i>	96. Others.
		97. Ribbons.
		98. Fringes and braids.
		99. Gold embroidery, uniforms, chasubles, etc.
		100. Other embroideries. ³
		101. Pluckers and cutters of hair.
		102. Cleaners, scourers, and dressers of hair.
		103. Brushes, brooms, and hair pencils.
		104. Hair cloths.
		105. Felt. ⁴

NOTE.—Excluding: ¹ Furniture workers in straw, 87; ² Elastic tissues (suspenders, garters, elastic stockings), 80; ³ Embroidery on linen goods, 268; ⁴ Hat makers, 266.

III. MANUFACTURE.—*Continued.*

1st Classification.	2nd Classification.	3rd Classification.
10. TEXTILES.— Continued.	24. <i>Feathers.</i>	106. Feather dressers; bed feathers. 107. Dressers of ornamental feathers. 108. Quills for writing. 109. Other feather industries.
	25. <i>Dyeing, printing, preparation and sponging of threads and tissues.¹</i>	110. Cotton. 111. Flax and hemp. 112. Straw. 113. Wool. 114. Silk. 115. Feathers.
11. SKINS, HIDES, AND HARD ANIMAL MATTER.	26. <i>Skins and hides.</i>	116. Tanners. ⁴ 117. Curriers. 118. Varnished skins. 119. Imitation skins. 120. Morocco dressers. 121. Hongroyeurs. 122. Tanners. 123. Chamois dressers. 124. Parchment makers.
	27. <i>Making of various leather articles.²</i>	125. Machine belts. 126. Leather box and trunk makers. 127. Leather stampers and moulders. 128. Leather gilders and silver platers. 129. Case and sheath makers, portfolio makers, etc.
	28. <i>Gut working.</i>	130. Sausage-skin makers. 131. Makers of gold-beater's skin. 132. Makers of cat-gut strings.
	29. <i>Furriers.</i>	133. Furriers, etc.
	30. <i>Hard animal matter.³</i>	134. Bone. 135. Ivory. 136. Horn. 137. Shell. 138. Whalebone. 139. Pearl-shell.
	31. <i>Saw mills, etc.</i>	140. Wood sawyers, sawing machines.
12. WOOD.	32. <i>Coopers.</i>	141. Coopers.
	33. <i>Wood turners.</i>	142. Wood turners.

NOTE.—Excluding: ¹ Dyers and cleaners, 82; ² Cordwainers and boot makers, 79; glove makers, 80; shoemakers, 80; belt makers, saddlers, and harness makers, 101. ³ Hair and horse hair, 23. ⁴ Excluding pluckers and cutters of hair, 101.

III. MANUFACTURE.—Continued.

1st Classification.	2nd Classification.	3rd Classification.
12. WOOD.— Continued.	34. <i>Other wood industries.</i> ¹	143. Modelers in wood. 144. Bushel and sieve makers. 145. Toy and box makers. 146. Packers. 147. Other wood industries.
	35. <i>Basket-makers.</i>	148. Basket-makers (wicker, birch broom, etc.).
	36. <i>Cork.</i>	149. Cork.
	37. <i>Other industries of woody materials.</i>	150. Articles in bamboo, rattan, cane, etc. ² 151. Other industries of woody materials.
13. METALLURGY. a. FORGING OF METALS.	38. <i>Forging and rolling of iron and steel; casting, blast furnaces, puddling furnaces.</i>	152. Forging and rolling of iron and steel, casting, blast furnaces, puddling furnaces.
	39. <i>Forging and rolling of other common metals.</i>	153. Forging and rolling of copper. 154. " " " " zinc. 155. " " " " tin. 156. " " " " nickel. 157. Forging and rolling of antimony. 158. Forging and rolling of aluminum. 159. Forging and rolling of lead. 160. Forging and rolling of other common metals.
	40. <i>Recasting of common metals once used.</i>	161. Recasting of common metals once used.
	41. <i>Refiners of precious metals.</i>	162. Refiners of precious metals.
b. MAKING OF METAL ARTICLES.	42. <i>Machines and tools principally or exclusively of iron.</i> ³	163. Iron cast and worked up for building; pieces of architecture cast; rails, cushions, axles, springs for carriages, and other pieces for constructing machines. 164. Machines of all kinds, fixed and movable motors, heating and ventilating apparatus, etc. Farming implements, jacks, velocipedes, seeding machines. Machine finishers. 165. Founders. 166. Smiths, tool makers, edge tools, sheet-iron workers, etc. 167. Farriers. 168. Armorers, makers of fire arms (guns, cannon, etc.).

NOTE.—Excluding: ¹ Wooden shoes and galosh makers, 79; furniture makers, 87; carpenters and joiners, 97; wheelrights and carriage makers, 100; boat makers, 102; makers of canes and umbrellas, 81; ² Makers of iron or brass beds, 88; ³ Canes and umbrellas, 279.

III. MANUFACTURE.—Continued.

1st Classification.	2nd Classification.	3rd Classification.
13. METALLURGY.— Continued. b. MAKING OF METAL ARTICLES.— Continued.	43. <i>Small articles chiefly or exclusively iron (knives, files, screws, nails, needles, pins, etc.).</i> ¹	169. Cutlery, side arms, burnishers, sharpeners, knife-whetters. 170. File makers. 171. Saw " 172. Screw and nail makers. 173. Needle makers. 174. Pin makers in all sorts of metal. 175. Makers of steel pens. 176. Makers of taps and other small steel and iron articles.
	44. <i>Articles chiefly copper.</i>	177. Copper and bronze founders. 178. Repoussé workers, cleansers. 179. Mounters.
	45. <i>Articles chiefly lead.</i> ²	180. Lead founders, lead pipes. 181. Type founders.
	46. <i>Articles chiefly tin.</i>	182. Pewterers. 183. Tin beaters, tin sheet. 184. Other tin industries.
	47. <i>Articles of other metals.</i> ³	185. Articles of zinc. ⁶ 186. " " nickel, nickelers. 187. " " aluminum. 188. " " other metals. 189. " " alloy (German silver).
	48. <i>Coppersmiths, tanners, tin-plate workers.</i>	190. Coppersmiths, tanners. 191. Tin-plate workers, lamp makers, preserve cans, and copper wares.
	49. <i>Metal turners, décolteurs.</i>	192. Metal turners, <i>décolteurs</i> .
	50. <i>Metal drawers, wire drawers, wires.</i> ⁴	193. Metal drawers, wire drawers, wires. 194. Telegraph and telephone wires. 195. Metallic ropes and cables. 196. Wire workers, metal webs. 197. Iron and brass chains.
	51. <i>Metal stampers, relief workers, coins and medals.</i>	198. Metal stampers, relief workers. 199. Coins and medals.
	52. <i>Other metallurgical industries.</i> ⁵	200. Makers of surgical instruments. 201. Makers of delicate instruments, optical, etc., and those pertaining to photography, telegraphy, etc. ⁷

NOTE.—Excluding : ¹ Locksmiths, 96 ; ² Plumbers, 95 ; ³ Industries of precious metals (gilders, gold beaters, etc.), 106 ; ⁴ Wire drawers of precious metals, 106 ; ⁵ Industries of precious metals, 106 ; ⁶ Zinc roofers, 300 ; ⁷ Musical instruments, 335.

III. MANUFACTURE.—Continued.

1st Classification.	2nd Classification.	3rd Classification.
14. CERAMICS.	53. <i>Glass making.</i>	204. Glasses and crystals, mirrors.
	54. <i>Porcelain and crockery.</i>	205. Porcelain.
		206. Pipe clay.
		207. Crockery.
	55. <i>Terra-cotta.</i>	208. Potters.
		209. Brick and tile makers.
		210. Earthen and sandstone pipe.
		211. Cisterns and filters.
	56. <i>Others.</i>	212. Articles of cement, concrete, imitation stone, etc.
		213. Mosaics.
		214. Others.
15. CHEMICAL PRODUCTS, PROPERLY SO CALLED AND ANALOGOUS.	57. <i>Chemical products, properly so called.</i>	215. Making of chemicals used in the arts and for medicine (acids, soda, potash, alum, etc.).
		216. Refineries of sea salt.
		217. " " sugar.
		218. Match factories.
	58. <i>Dyes and inks; paints.</i>	219. Factories for explosible materials (powder, dynamite, etc.).
		220. Making of artificial mineral waters.
		221. Manufacture of colors with lead base (white or red lead, etc.).
		222. Manufacture of oxide of zinc and other colors of metallic base.
	59. <i>Fatty and analogous bodies (tallow, oils from every source, albumen, bone black, etc.).</i>	223. Manufacture of colored pencils, paste pencils.
		224. Manufacture of other colors (aniline, vegetable dyes, cochineal, etc.).
		225. Manufacture of writing inks.
		226. Manufacture of thick inks.
	60. <i>Substances derived from fatty bodies (wax candles, soap, etc.).</i>	227. Manufacture of tallow, glue, fats, and animal oils, bone black, albumen, artificial manure of animal origin, etc.
		228. Manufacture and refining of vegetable oils.
		229. Refining of petroleum, vasoline, etc.
		230. Manufacture of candles.
		231. " " wax candles.
		232. " " soap.

III. MANUFACTURE.—*Continued.*

1st Classification.	2nd Classification.	3rd Classification.
15. CHEMICAL PRODUCTS, PROPERLY SO CALLED AND ANALOGOUS.— Continued.	61. <i>Coatings and impermeable substances.</i>	233. Varnish, wax, blacking. 234. Waxed cloths, linoleum, and gummy articles. 235. India rubber and gutta-percha. 236. Bitumen, asphalt. 237. Tar, resin, resinous products, kindling, patent fuel, etc.
	62. <i>Paper industries.</i> ¹	238. Manufacture of paper. 239. Manufacture of paste-board, articles of mill-board. 240. Manufacture of celluloid.
	63. <i>Others.</i> ²	241. Flour and starch manufacture, glucose, dextrine. 242. Perfumery manufacture. 243. Others.
16. FOOD INDUSTRIES.	64. <i>Millers and flour factors.</i>	244. Millers and flour makers.
	65. <i>Bakers.</i>	245. Bakers.
	66. <i>Other industries pertaining to the preparation of cereals.</i>	246. Pastry cooks. 247. Biscuits. 248. Dough cakes, sea biscuits.
	67. <i>Butchers, pork, tripe, and salt provision dealers.</i>	249. Butchers. 250. Pork, tripe, and salt provision dealers.
	68. <i>Preserved meat, cheese, creams, etc.</i>	251. Canned meats. 252. " fish. 253. Manufacture of cheese, cream, condensed milk, etc.
	69. <i>Vinegar, mustard, and other condiments.</i>	254. Vinegar, mustard, and other condiments.
	70. <i>Sugar refiners.</i>	255. Sugar refiners.
	71. <i>Other industries pertaining to solid foods.</i>	256. Canning of vegetables. 257. Chocolate making. 258. Coffee burners. 259. Making of ices and confections.
	72. <i>Breweries and malt manufactories.</i>	260. Manufacture of malt. 261. Breweries.
	73. <i>Distilleries and liquor manufactories.</i>	262. Distilleries. 263. Manufacture of liquors.
	74. <i>Other industries pertaining to drinks.</i>	264. Other industries pertaining to drinks.
	75. <i>Manufacture of tobacco.</i>	265. Manufacture of tobacco.

NOTE.—Excluding: ¹ Book-binders, stitchers, etc., 110; ² sugar refiners, 70; distillers, 73.

III. MANUFACTURE.—Continued.

1st Classification.	2nd Classification.	3rd Classification.
17. INDUSTRIES OF DRESS AND THE TOILET.	76. <i>Makers of hats, caps, skull caps, smoking caps, etc.</i>	266. Makers of hats, caps, skull caps, smoking caps, etc.
	77. <i>Tailors, clothiers, costumers.</i>	267. Tailors, clothiers, and costumers.
	78. <i>Sewers, makers of dresses and artificial flowers.</i>	268. Sewers, makers of linen garments, shirts, plain needlework, corsets, embroidery on linen, etc. 269. Fashionable dressmakers. 270. Flowers, leaves, wreaths.
	79. <i>Manufacturers of foot-wear.</i>	271. Cord-wainers and shoemakers. 272. Socks and slippers. 273. Wooden shoes, galoshes, etc.
	80. <i>Other industries pertaining to dress.¹</i>	274. Glove makers. 275. Pantaloon and gaiter makers. 276. Makers of belts, etc. 277. Metallic and cloth buttons. 278. Elastic tissues, suspenders, garters, elastic stockings, trusses, etc.
	81. <i>Canes, parasols, and umbrellas.</i>	279. Canes, parasols, and umbrellas.
	82. <i>Dyers and cleaners.²</i>	280. Dyers and cleaners.
	83. <i>Bleachers, wash-houses and laundries, washers and ironers.</i>	281. Bleachers, wash-houses and laundries, washers and ironers.
	84. <i>Baths.</i>	282. Baths.
	85. <i>Barbers, hair dressers and wig makers, hair work.</i>	283. Barbers, hair dressers and wig makers, hair work.
18. FURNITURE INDUSTRIES.	86. <i>Others.</i>	284. Others.
	87. <i>Cabinet-makers, manufacturers of furniture.³</i>	285. Cabinet makers, manufacturers of furniture, fluters and straw-workers for cabinet work. 286. Wood carvers, inlayers, fret-work makers in wood and brass. 287. Piano and furniture varnishers, carriage painters.
	88. <i>Upholsterers, bed furnishings.</i>	288. Upholsterers, makers of mattresses and other bed furnishings, makers of cushions, blinds, etc. 289. Makers of iron and brass beds.

NOTE.—¹ Excluding furriers, 29. ² Not to be confounded with dyers, 25. ³ Excluding carpenters, 97.

III. MANUFACTURE — *Continued.*

1st Classification.	2nd Classification.	3rd Classification.
18. FURNITURE INDUSTRIES.— Continued.	89. <i>Glasses and mirrors.</i> ¹	290. Making of glass and mirrors; polishers and silverers of glass.
	90. <i>Scrubbers, waiters, and waitresses.</i>	291. Scrubbers, waiters and waitresses.
	91. <i>Others.</i>	292. Others.
19. BUILDING INDUSTRIES.	92. <i>Lime and plaster kilns, manufactories of cement.</i>	293. Lime and plaster kilns, manufactories of cement.
	93. <i>Excavators, well-sinkers.</i>	294. Excavators, well-sinkers.
	94. <i>Plasterers and stone cutters.</i> ²	295. Workers in masonry and plasterers.
		296. Stone-cutters, flagstone makers, sandstone workers, slate-cutters, etc.
		297. Marble workers, carvers.
		298. Ornamenters, moulders, decorators, moulding makers.
		299. Chimney builders and sweeps, floor tilers, tilers.
	95. <i>Roofers, zinc workers, plumbers, gas-fitters.</i>	300. Roofers, zinc workers, plumbers, and gas-fitters,
	96. <i>Locksmiths.</i> ³	301. Locksmiths.
	97. <i>Carpenters and joiners.</i>	302. Carpenters.
		303. Joiners, banister makers.
		304. Planers, floor layers.
20. CONSTRUCTION OF APPARATUS OF TRANSPORTATION.	98. <i>House painters, etc.</i>	305. Making of painted papers.
		306. Colorers of paper. ⁴
		307. Painters, glaziers, white-washers, gilders, sign painters.
	99. <i>Others.</i>	308. Others.
	100. <i>Wheelrights and carriage makers.</i> ⁵	309. Wheelrights.
		310. Carriage makers.
	101. <i>Saddlers, harness makers, whip and lash makers.</i>	311. Saddlers, harness makers, whips and lashes (pack saddles, saddle bows, hames, etc.
	102. <i>Boat making.</i>	312. Building of wooden and iron ships.
		313. Breaking up of boats.
	103. <i>Wagon making.</i>	314. Wagon making.

NOTE.— Excluding: ¹ Looking-glasses without quick-silver, 53; ² Stone breakers, road laborers, etc., 123. ³ Includes coach-smiths. ⁴ Excludes makers of cushions, carriage springs, 42; coach-smiths, 96; carriage painters, 87. ⁵ Includes colorers of play bills.

III. MANUFACTURE.—Continued.

1st Classification.	2nd Classification.	3rd Classification.
21. PRODUCTION AND TRANSMISSION OF PHYSICAL FORCES (HEAT, LIGHT, ELECTRICITY, ETC.).	104. <i>Gas works.</i>	315. <i>Gas works.</i>
	105. <i>Others.</i>	316. Production and transmission of electricity (light, motive power).
22. INDUSTRIES OF LUXURY AND THOSE PERTAINING TO THE ARTS, SCIENCES, AND LETTERS.		317. Production and transmission of heat (water, air, etc.).
		318. Production and transmission of cold, artificial ice, etc.
		319. Production and transmission of compressed air (pneumatic clocks, motive power, etc.).
	106. <i>Industries of precious stones (jewelers, gold-beaters, gold-platers, etc.).</i>	320. Real and imitation jewelry, goldsmiths, lapidaries, jewelers, enamel workers, etc.
		321. Gold-beaters, burnishers, drawers of precious metals.
		322. Gilders on wood and metal, framers.
	107. <i>Clock-makers.</i>	323. Articles of clock-work.
		324. Clock-makers.
	108. <i>Toys, etc.</i>	325. Fans, purses, tobacco pouches, etc.; articles in alabaster, shell, etc.
		326. Children's toys, games.
		327. Playing cards.
		328. Small articles of various kinds, hunting and fishing articles.
	109. <i>Printers, journalists, etc.</i>	329. Letter-press printers, electrotypers.
		330. Heliographers, photo-gravure makers.
		331. Lithography, copper-plate engraving.
		332. Paper stampers, colorers, and illuminators.
		333. Editors of papers and periodicals.
	110. <i>Book-binders and stitchers.</i>	334. Book-binders, stitchers and gatherers, paper pressers, folders, marblers, makers of envelopes.
	111. <i>Makers of musical instruments, pianos, lutes.</i>	335. Makers of musical instruments, pianos, lutes.
	112. <i>Copyists, stenographers, translators.</i>	336. Public writers, copyists.
		337. Stenographers.
		338. Translators, interpreters.

III. MANUFACTURE.—Continued.

1st Classification.	2nd Classification.	3rd Classification.
22. INDUSTRIES OF LUXURY AND THOSE PERTAINING TO THE ARTS, SCIENCES, AND LETTERS.— Continued.	113. <i>Others.</i>	339. Preparers of objects of natural history, taxidermists, naturalists. 340. Managers of theatres and concerts. 341. Others.
23. INDUSTRIES CONCERNED WITH REFUSE MATTER.	114. <i>Industries of refuse matter.</i>	342. Rag gatherers, washers, sorters, shoddy makers, rag rippers. 343. Night-men.
24. OTHER INDUSTRIES.	115. <i>Other industries.</i>	344. Other industries.
25. INDUSTRIES NOT WELL DETERMINED.	116. <i>Makers, manufacturers, and industrials (without other designation).</i> 117. <i>Workmen, task-masters, day laborers, general jobbers, etc. (without other designation).</i>	345. Makers, manufacturers, and industrials (without other designation). 346. Workmen, task-masters, day laborers, general jobbers (without other designation).

IV. TRANSPORTATION.

1st Classification.	2nd Classification.	3rd Classification.
26. MARITIME TRANSPORTATION.	118. <i>Agents specially charged with the maintenance and guarding of marine ports, superintendents of harbors and their agents, dock-keepers, etc.</i> 119. <i>Ship owners and their employes, ship brokers.</i> 120. <i>Sailors not connected with the navy.</i>	347. Agents specially charged with the maintenance and guarding of marine ports, superintendents of harbors and their agents, dock-keepers, etc. 348. Ship owners and their employes, ship brokers. 349. Trading sailors. 350. Fishing sailors.
27. FRESH-WATER TRANSPORTATION.	121. <i>Agents specially charged with the care of streams, rivers, and canals (inspectors of navigation, lock-keepers, etc.).</i> 122. <i>Sailors, boat-men, tow-men, tug-men, and trackers.</i>	351. Agents specially charged with the care of rivers, streams, and canals, inspectors of navigation, lock-keepers, etc. 352. Sailors, boat-men, tug-men, tow-men, and trackers.
28. ROAD, STREET, AND BRIDGE TRANSPORTATION.	123. <i>Agents specially charged with maintenance of streets, sewers, roads, and bridges (sweepers, sewer-men, road laborers, etc.).</i>	353. Agents specially charged with the maintenance of streets, roads, sewers, and bridges (sweepers, sewer-men, road laborers, etc.).

IV. TRANSPORTATION.—*Continued.*

1st Classification.	2nd Classification.	3rd Classification.
28. ROAD, STREET, AND BRIDGE TRANSPORTATION. — Continued.	124. <i>Coachmen and carters.</i>	354. Carters. 355. Coachmen, carriage cleaners, grooms of liverys, hacks, omnibus, street cars, <i>diligences</i> (managers and agents of all sorts).
	125. <i>Street porters and livreurs.</i>	356. Street porters, unloaders of boats and wagons, furniture carriers, etc. 357. <i>Livreurs</i> , collecting clerks, etc.
29. TRANSPORTATION BY RAILROAD.	126. <i>Railroads: directors, employes, workmen, agents of every kind.</i>	358. Railroad, directors, employes, workmen, agents of every sort.
30. POST, TELEGRAPH, AND TELEPHONE.	127. <i>Post, telegraph, and telephone.</i>	359. Post, telegraph, telephone.

V. TRADE.

1st Classification.	2nd Classification.	3rd Classification.
31. BANKS, ESTABLISHMENTS OF CREDIT, EXCHANGE, AND INSURANCE.	128. <i>Bankers, exchange brokers and their employes.</i>	360. Bankers, directors and employes, agents in establishments of credit. 361. Agents of exchange, bill brokers, commission agents and their employes.
	129. <i>Insurance companies.</i>	362. Insurance companies.
32. BROKERAGE, COMMISSION, EXPORTATION.	130. <i>Brokers in various kinds of merchandise, exporters.</i>	363. Brokers in various kinds of merchandise, exporters.
	131. <i>Brokers without other designation, canvassers, agents, commercial travellers, etc.</i>	364. Brokers without other designation, canvassers, agents, commercial travellers, etc.
33. TRADE IN TEXTILES.	132. <i>Wholesale merchants dealing in wool, cotton, silks, cloths, linen, and other textiles.</i>	365. Wholesale dealers in wool, cotton, silks, cloths, linen, and other textiles.
34. TRADE IN SKINS, LEATHER, AND FURS.	133. <i>Wholesale trade in skins, leather and furs, etc.</i>	366. Wholesale trade in skins, leather, furs, etc.
35. TRADE IN WOODS.	134. <i>Wholesale trade in wood for carpenter work and cabinet work, cork, bark, etc.</i>	367. Wholesale trade in wood for carpenter work, cabinet work, cork, bark, etc.

V. TRADE.—Continued.

1st Classification.	2nd Classification.	3rd Classification.
36. TRADE IN METALS.	135. <i>Trade in metals, etc.</i>	368. Trade in metals.
37. TRADE IN CERAMICS.	136. <i>Trade in raw materials necessary to ceramics, and in ceramic products.</i>	369. Trade in raw materials necessary to ceramics and in ceramic products.
38. TRADE IN CHEMICAL PRODUCTS, DRUGS, PAINTS, ETC.	137. <i>Trade in chemical products, drugs, paints, etc.</i>	370. Trade in chemical products, drugs, paints, etc.
39. HOTELS, CAFES, RESTAURANTS, SALOONS.	138. <i>Hotels, cafes, restaurants, saloons.</i>	271. Wine and liquor merchants. 372. Café keepers. 373. Restaurant and cook-shop keepers. 374. Lodging-house keepers.
40. OTHER TRADE IN FOOD-STUFFS.	139. <i>Other trade in food stuffs (grocers, fruiterers, dealers in seeds, cattle, etc.)</i>	375. Grocers. 376. Butter, eggs, cheese, fish, poultry, fruits, and vegetables. 377. Dealers in grain, wheat, corn, and fodder. 378. Dealers and drivers of cattle. 379. Tobacco merchants. 380. Others.
41. TRADE IN CLOTHING AND TOILET ARTICLES.	140. <i>Trade in fabrics and ready-made clothing.</i>	381. Novelties, fabrics, hosiery, haberdashery, gloves, linen goods, and perfumery. 382. Ready-made clothing for men and women. 383. Old clothes, wardrobe dealers, second-hand clothes merchants.
	141. <i>Hat merchants.¹</i>	384. Hat merchants. ¹
	142. <i>Dealers in foot-wear.²</i>	385. Dealers in foot-wear. ²
42. TRADE IN FURNITURE.	143. <i>Furniture, carpets, curtains, bed furnishings.</i>	386. Furniture, carpets, curtains, bed furnishings.
	144. <i>Hardware, household utensils, porcelain, pottery, cut glass, bottles, house furnishings.</i>	387. Hardware, household utensils, porcelain, pottery, cut glass, bottles, house furnishings.
43. TRADE IN BUILDING MATERIALS.	145. <i>Trade in building materials (stones, bricks, plaster, cement, sand, etc.).</i>	388. Trade in building materials (stone, brick, plaster, cement, sand, etc.).
	146. <i>Locating agencies.</i>	389. Locating agencies.
45. TRADE IN COMBUSTIBLES.	147. <i>Dealers in fuel-wood, charcoal, coal, coke, etc.</i>	390. Dealers in fuel-wood, charcoal, coal, coke, etc.
46. TRADE IN MEANS OF TRANSPORTATION. ¹	148. <i>Dealers in horses, asses, etc.</i>	391. Dealers in horses, asses, etc.

¹ Excluding livery-stable keepers, etc. ² Includes only merchants who do not manufacture.

V. TRADE.—Continued.

1st Classification.	2nd Classification.	3rd Classification.
46. TRADE IN ARTICLES OF LUXURY, AND THOSE PERTAINING TO THE ARTS, LETTERS, SCIENCES.	149. <i>Dealers in jewels, clocks, and watches, opticians, etc.</i>	392. Dealers in jewels, clocks, and watches, opticians, etc.
	150. <i>Dealers in notions, children's toys, fans, natural flowers, etc.</i>	393. Dealers in notions, children's toys, fans, natural flowers, etc.
	151. <i>Stationery, libraries, dealers in books, music, and periodicals; book collectors.</i>	394. Stationers, libraries, dealers in books, music, periodicals, book collectors.
	152. <i>Dealers in engravings, paintings, art notions, etc.</i>	395. Dealers in engravings, paintings, art notions, etc.
	153. <i>Dealers and lenders of pianos and other musical instruments.</i>	396. Dealers and lenders of pianos and other musical instruments.
47. TRADE IN REFUSE MATTER.	154. <i>Trade in refuse matters (rags, manure, and rubbish).</i>	397. Rag dealers. 398. Dealers in natural manure (mud, sewage, manure, etc.).
48. TRADE OF OTHER SORTS.	155. <i>Retail shop-keepers without definite specialty.</i>	399. Retail shop-keepers without definite specialty.
	156. <i>Merchants on the highway, peddlers, hawkers, packmen, etc.</i>	400. Merchants on the highway, peddlers, hawkers, packmen, etc.
	157. <i>Quacks, acrobats, exhibitors of curiosities, wild animals, etc.</i>	401. Quacks, acrobats, exhibitors of curiosities, wild animals, etc.
	158. <i>Other kinds of trade.</i>	402. Other kinds of trade.
49. UNDETERMINED TRADE.	159. <i>Accountants and cashiers.</i>	403. Accountants and cashiers.
	160. <i>Merchants without other designation.</i>	404. Merchants without other designation.
	161. <i>Trade employes, shop-girls without other designation.</i>	405. Trade employes, shop-girls without other designation.
	162. <i>Shop-clerks without other designation.</i>	406. Shop-clerks without other designation.

VI. PUBLIC FORCE.

1st Classification.	2nd Classification.	3rd Classification.
50. LAND ARMY.	163. <i>Land army.</i>	407. Land army.
51. NAVY.	164. <i>Navy.</i>	408. Navy.
52. GENDARMERY AND POLICE.	165. <i>Gendarmery and police.</i>	409. Gendarmery and police.

VII. PUBLIC ADMINISTRATION.

1st Classification.	2nd Classification.	3rd Classification.
53. PUBLIC ADMINISTRATION.	166. <i>Public administration.</i>	410. Public administration.

VIII. LIBERAL ARTS.

1st Classification.	2nd Classification.	3rd Classification.
54. RELIGIOUS ORDERS. ¹	167. <i>Catholic clergy.</i>	411. Secular clergy (arch-bishops, bishops, curés, canons, vicars, officiating clergymen, priests, etc.).
		412. Regular clergy (friars or nuns belonging to congregations or religious orders).
	168. <i>Protestant religion.</i>	413. Protestant religion.
	169. <i>Jewish religion.</i>	414. Jewish religion.
	170. <i>Beadles, head beadles, sextons, and other paid officials.</i>	415. Beadles, head beadles, sextons, and other paid officials.
55. LAW.	171. <i>Magistrates and members of courts of every degree.</i>	416. Magistrates and members of courts of every degree.
	172. <i>Other men of law and their clerks.</i>	417. Lawyers.
		418. Public officers (notaries, attorneys, bailiffs, etc.) and their clerks.
		419. General agents.
56. MEDICINE.	173. <i>Physicians and surgeons.</i>	420. Physicians and surgeons.
	174. <i>Dentists (not physicians).</i>	421. Dentists (not physicians).
	175. <i>Midwives, accoucheurs.</i>	422. Midwives, accoucheurs.
	176. <i>Veterinary surgeons.</i>	423. Veterinary surgeons.
	177. <i>Pharmacists and herbalists.</i>	424. Pharmacists and herbalists.
	178. <i>Nurses, shampooers, cuppers, etc.</i>	425. Nurses, shampooers, cuppers, etc.
	179. <i>Directors (not physicians) of every kind of sanitarium, hospital, asylum, etc., and their employes (attendants, watchers, workmen, etc.).</i>	426. Directors (not physicians) of every kind of hospital sanitarium, asylums, etc., and their employes (attendants, watchers, workingmen, etc.).
57. INSTRUCTION.	180. <i>Professors of any title whatever in educational institutions maintained by the state, province, commune (primary schools, colleges, universities, etc.).</i>	427. Professors of any title whatever in educational institutions maintained by the state, province, commune (primary schools, colleges, universities, etc.).

NOTE.—¹ The order and nomenclature of the different religions will vary with the country.

VIII. LIBERAL ARTS.—Continued.

1st Classification.	2nd Classification.	3rd Classification.
57. INSTRUCTION.— Continued.	181. <i>Other professors.</i>	428. Professors in private institutions. 429. Instructors in private families. 430. Professors in the accomplishments (music, dancing, drawing, fencing, etc.).
58. SCIENCES, LETTERS AND ARTS.	182. <i>Men of letters.</i>	431. Men of letters.
	183. <i>Architects, engineers.</i>	432. Architects. 433. Geometricians, engineers.
	184. <i>Plastic arts.</i>	434. Photographers. 435. Painters, sculptors, engravers, designers for decorative arts.
	185. <i>Music and the drama.</i>	436. Musical artists (composers, instrumentalists, vocalists, etc.). 437. Lyric and dramatic artists, dancers, chorus girls, etc.

IX. PERSONS LIVING SOLELY ON THEIR INCOMES.

1st Classification.	2nd Classification.	3rd Classification.
59. PERSONS LIVING SOLELY ON THEIR INCOMES.	186. <i>Proprietors, fund holders, and persons of independent income.</i>	438. Proprietors living solely upon the income from landed estates. 439. Fund holders. 440. Persons of independent income, pensioners upon the state and other public or private trustees.
	187. <i>Persons of occupation not well determined.</i>	441. Persons of occupation not well determined (calling themselves esquire, burger or privat, or claiming an occupation formerly carried on, or giving as their occupation some titular distinction, etc.)

X. DOMESTICS AND MISCELLANEOUS.

1st Classification.	2nd Classification.	3rd Classification.
60. DOMESTICS.	188. <i>Porters, shop and wood-yard clerks.</i>	442. Porters, shop and wood-yard clerks.
	189. <i>Cooks, male and female.</i>	443. Cooks, male and female.
	190. <i>Coachmen and grooms.</i>	444. Coachmen and grooms.
	191. <i>Other domestics.</i>	445. Other domestics. 446. <i>Femmes de ménage.</i>

X. DOMESTICS AND MISCELLANEOUS.—*Continued.*

1st Classification.	2nd Classification.	3rd Classification.
61. PERSONS TEMPORARILY UNEMPLOYED.	192. <i>Persons temporarily unemployed.</i>	447. Persons temporarily unemployed.
62. PERSONS OF NO OCCUPATION.	193. <i>Persons with no occupation.</i>	448. Persons with no occupation.
63. NON-CLASSIFIED.	194. <i>Children unoccupied, school children and students.</i>	449. Children unoccupied by reason of age. 450. School children. 451. Students.
	195. <i>Invalids, insane and prisoners.</i>	452. Invalids and hospital inmates. 453. Insane. 454. Prisoners.
64. BEGGARS, VAGRANTS, PROSTITUTES.	196. <i>Beggars, vagrants, prostitutes.</i>	455. Beggars, vagrants, prostitutes.
65. OCCUPATION UNKNOWN.	197. <i>Occupation unknown.</i>	456. Occupation unknown.

C. TABLE SHOWING THE DISTINCTIONS TO BE ESTABLISHED CONCERNING EACH OCCUPATION.

	Those Working for Their Own Benefit.								Members of Families Dependent upon them.			
	Under 20 Years.		20-39.		40-59.		60-00.		0-19.		20-00.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Employers..												
Employees..												
Workmen..												

GROWTH OF CITIES IN THE UNITED STATES DURING THE DECADE 1880-90.*

BY CARL BOYD.

No more significant fact has been disclosed by the last census than the great increase which has taken place in the urban population of the country during the last decade. In 1890 the urban population constituted 29.20 per cent of the total population. Corresponding figures for the several censuses are given in the following table : —

Census Years.	Population of the United States.	Population of Cities.	Inhabitants of Cities in Each 100 of the Total Population.
1790	3,929,214	131,472	3.35
1800	5,308,483	210,873	3.97
1810	7,239,881	356,920	4.93
1820	9,633,822	475,135	4.93
1830	12,866,020	864,509	6.72
1840	17,069,453	1,453,994	8.52
1850	23,191,876	2,897,586	12.49
1860	31,443,321	5,072,256	16.13
1870	38,558,371	8,071,875	20.93
1880	50,155,783	11,318,547	22.57
1890	62,622,250	18,284,385	29.20

The increase, it will be noted, has been quite regular from 1790 to 1880, in which time the city denizens increased from 3.35 per cent of the total population to 22.57 per cent; but from 1880 to 1890 there has been a leap from 22.57 per cent to 29.20 per cent.

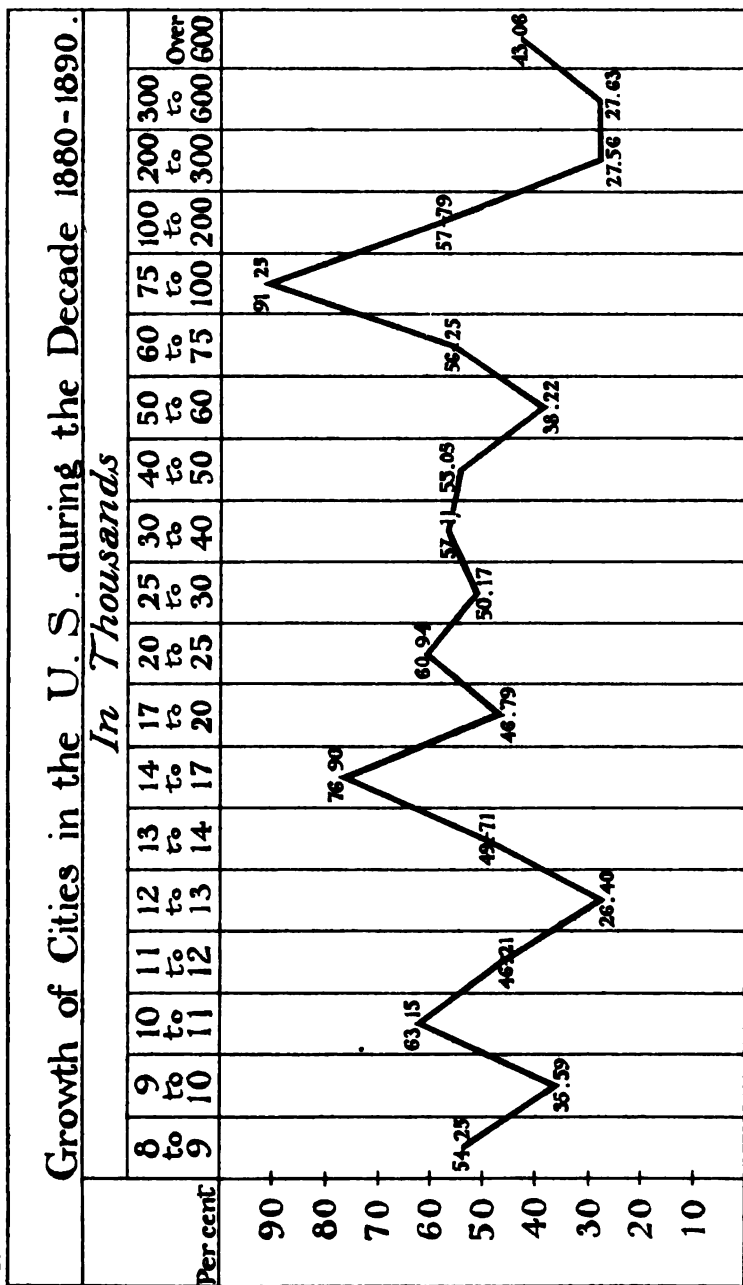
This remarkable increase has been associated in the minds of the general public with the growth of the great metropolises of the country. The present inquiry has been undertaken with a view to localizing this increase, and to ascertaining the relation which cities of various sizes bear to it. This has developed the fact, which it is hoped the accompanying diagrams will emphasize, that New York and Chicago, and others of their class, are not of such paramount importance in the growth of urban population as has been supposed.

In diagram No. I the cities have been divided into 19 classes, and the facts are shown in great detail. The maximum increase is found in cities of from 75,000 to 100,000 inhabitants, which have increased 91.25 per cent. The striking decrease in the rate of growth of cities of more than 100,000 inhabitants is worthy of note.

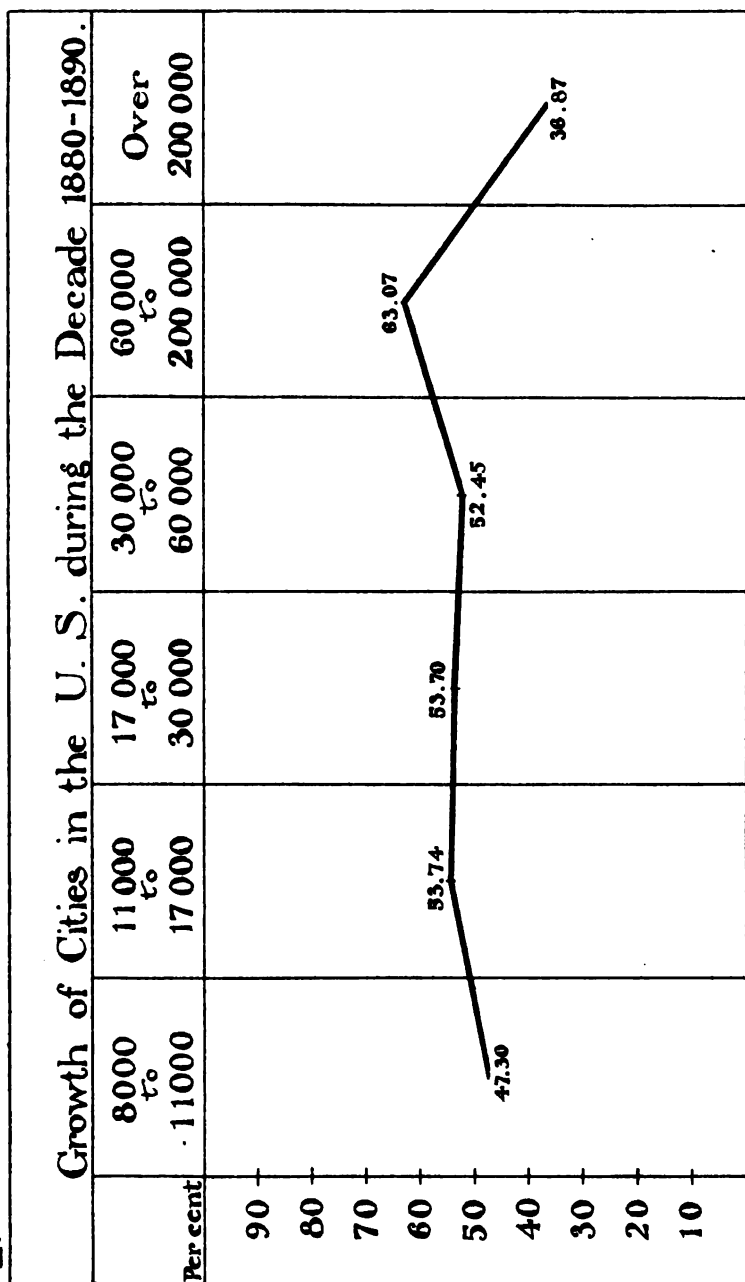
In diagram No. II the 19 classes of the preceding diagram have

* All the data for this article have been derived from Census Bulletin No 52.

I.



II.



61] *Growth of Cities in United States During 1880-90.* 417

been combined into six classes. Since each of these contains a larger number of cities, the percentages are less affected by accidental causes. It will be noted that here also cities of moderate size show the greatest growth. Those having a population ranging from 60,000 to 200,000 have increased 63.07 per cent; while those of more than 200,000 inhabitants show an increase of only 36.87 per cent.

As to the method employed the cities have been classified on the basis of the average of their population in 1880 and 1890. Thus, Toledo, with a population of 50,137 in 1880, and 81,434 in 1890, has been classed as a city of 65,786. Per cents, however, have been calculated upon the usual basis. An average population of 8000 has been taken as the lower limit. In grouping the cities it was desirable to have as many as possible in each class; but when this principle would necessitate the association of cities of considerable variation in size, it has been disregarded, and only those cities which would naturally fall in the same group, even though few in number, have been classed together. This applies especially to cities of 50,000 inhabitants or more. Among the smaller cities larger subdivisions with smaller increment have been possible.

GROWTH OF CITIES IN THE UNITED STATES DURING THE DECADE 1880-90.

Class.	Classification.	Number in Group.	Population.		Increase.	
			1890.	1880.	Number.	Per Cent.
I	Cities over 600,000	4 Cities	4,468,458	3,123,317	1,345,141	43.06
II	" 300,000 to 600,000	3 "	1,334,686	1,045,670	289,016	27.63
III	" 200,000 to 300,000	5 "	1,324,000	1,037,946	286,054	27.56
IV	" 100,000 to 200,000	10 "	1,847,056	1,170,560	676,496	57.79
V	" 75,000 to 100,000	6 "	711,970	372,272	339,698	91.25
VI	" 60,000 to 75,000	12 "	987,465	631,964	355,501	56.25
VII	" 50,000 to 60,000	6 "	377,704	273,246	104,458	38.22
VIII	" 40,000 to 50,000	11 "	607,137	391,561	215,576	55.05
IX	" 30,000 to 40,000	23 "	967,082	615,557	351,525	57.11
X	" 25,000 to 30,000	16 "	531,884	354,181	177,703	50.17
XI	" 20,000 to 25,000	33 "	915,175	568,642	346,533	60.94
XII	" 17,000 to 20,000	32 "	702,048	475,336	226,712	47.69
XIII	" 14,000 to 17,000	32 "	622,580	351,931	270,649	76.90
XIV	" 13,000 to 14,000	21 "	339,831	226,982	112,849	49.71
XV	" 12,000 to 13,000	19 "	285,576	210,094	55,482	26.40
XVI	" 11,000 to 12,000	21 "	290,055	198,373	91,682	46.21
XVII	" 10,000 to 11,000	19 "	244,207	149,677	94,530	63.15
XVIII	" 9,000 to 10,000	44 "	485,250	357,875	127,375	35.69
XIX	" 8,000 to 9,000	39 "	403,325	261,474	141,851	54.25
Class A	Cities 200,000 and over	12 Cities	7,127,144	5,206,933	1,920,211	36.87
" B	" 60,000 to 200,000	28 "	3,546,491	2,174,796	1,371,695	63.07
" C	" 30,000 to 60,000	40 "	1,951,923	1,280,364	671,559	52.45
" D	" 17,000 to 30,000	81 "	2,149,107	1,398,159	750,948	53.72
" E	" 11,000 to 17,000	93 "	1,518,042	987,380	530,662	53.74
" F	" 8,000 to 11,000	102 "	1,132,782	769,026	363,756	47.30

GROWTH OF CITIES IN THE UNITED STATES DURING THE DECADE 1880-90.

Classification.	Cities in Group.	Population.		Increase.	
		1890.	1880.	Number.	Per Cent.
Class I.	New York, N. Y.....	1,515,301	1,206,299	309,002	25.62
Cities over 600,000	Chicago, Ill.....	1,009,850	503,185	506,665	118.58
	Philadelphia, Penn.....	1,046,964	847,170	199,794	23.58
	Brooklyn, N. Y.....	806,343	566,663	239,680	42.30
Class II.					
Cities 300,000 to 600,000	St. Louis, Mo.....	451,770	350,518	101,252	28.89
	Boston, Mass.....	448,477	362,839	85,638	23.60
	Baltimore, Md.....	434,439	332,313	102,126	30.73
Class III.					
Cities 200,000 to 300,000	San Francisco, Cal.....	298,997	233,959	65,038	27.80
	Cincinnati, O.....	206,908	255,139	41,769	16.37
	Buffalo, N. Y.....	255,664	155,134	100,530	64.80
	New Orleans, La.....	242,039	216,090	25,949	12.01
	Washington, D. C.....	230,392	177,624	52,768	29.71
Class IV.					
Cities 100,000 to 200,000	Cleveland, O.....	261,353	160,146	101,207	63.20
	Pittsburg, Penn.....	238,617	156,389	82,228	52.58
	Detroit, Mich.....	205,876	116,340	89,536	76.96
	Milwaukee, Wis.....	204,468	115,587	88,881	76.90
	Newark, N. J.....	181,830	136,508	45,322	33.20
	Minneapolis, Minn.....	164,738	46,887	117,851	251.35
	Jersey City, N. J.....	163,003	120,722	42,281	35.02
	Louisville, Ky.....	161,129	123,758	37,371	30.20
	Rochester, N. Y.....	133,806	89,366	44,530	49.83
	Providence, R. I.....	132,146	104,857	27,289	26.02
Class V.					
Cities 75,000 to 100,000	Omaha, Neb.....	140,452	30,518	109,934	360.23
	St. Paul, Minn.....	133,156	41,473	91,683	221.07
	Kansas City, Mo.....	132,716	55,785	76,931	137.91
	Indianapolis, Ind.....	105,436	75,056	30,380	40.48
	Allegheny, Penn.....	105,287	78,682	26,605	33.81
	Albany, N. Y.....	94,923	90,758	4,165	4.59
Class VI.					
Cities 60,000 to 75,000	Denver, Col.....	106,713	35,629	71,084	199.51
	Columbus, O.....	88,150	51,647	36,503	70.68
	Syracuse, N. Y.....	88,143	51,792	36,351	70.19
	Worcester, Mass.....	84,655	58,291	26,364	45.23
	Toledo, O.....	81,434	50,137	31,297	62.42
	Richmond, Va.....	81,388	63,600	17,788	27.97
	New Haven, Conn.....	81,298	62,882	18,416	29.29
	Patterson, N. J.....	78,347	51,031	27,316	53.53
	Lowell, Mass.....	77,696	59,475	18,221	30.64
	Scranton, Penn.....	75,215	45,850	29,365	64.05
	Fall River, Mass.....	74,398	48,961	25,437	51.96
	Cambridge, Mass.....	70,028	52,669	17,359	32.96
Class VII.					
Cities 50,000 to 60,000	Atlanta, Ga.....	65,533	37,409	28,124	75.18
	Charleston, S. C.....	54,965	49,944	4,971	9.96
	Nashville, Tenn.....	76,168	43,350	32,818	75.70
	Reading, Penn.....	58,661	43,278	15,383	35.54
	Troy, N. Y.....	60,956	56,747	4,209	7.42
	Wilmington, Del.....	61,431	42,478	18,953	44.62

GROWTH OF CITIES.—*Continued.*

Classification.	Cities in Group.	Population.		Increase.	
		1890.	1880.	Number.	Per Cent.
Class VIII.					
Cities 40,000 to 50,000	Memphis, Tenn.....	64,495	33,592	30,903	92.00
	Dayton, O.....	61,220	38,678	22,542	58.28
	Grand Rapids, Mich.....	60,278	32,016	28,262	88.27
	Camden, N. J.....	58,313	41,659	16,654	39.98
	Trenton, N. J.....	57,458	29,910	27,548	92.10
	Lynn, Mass.....	55,727	38,274	17,453	45.60
	Hartford, Conn.....	53,230	42,015	11,215	26.69
	St. Joseph, Mo.....	52,324	32,431	19,893	61.34
	Evansville, Ind.....	50,756	29,280	21,476	73.35
	Oakland, Cal.....	48,682	34,555	14,127	40.88
	Lawrence, Mass.....	44,654	39,151	5,503	14.06
Class IX.					
Cities 30,000 to 40,000	Bridgeport, Conn.....	48,866	27,643	21,223	76.78
	Covington, Ky.....	37,371	29,720	7,651	25.74
	Des Moines, Ia.....	50,093	22,408	27,685	123.55
	Elizabeth, N. J.....	37,764	28,229	9,535	33.78
	Erie, Penn.....	40,634	27,737	12,897	46.50
	Ft. Wayne, Ind.....	35,393	26,880	8,513	31.67
	Harrisburg, Penn.....	39,385	30,762	8,623	28.03
	Hoboken, N. J.....	43,648	30,999	12,649	40.80
	Lincoln, Neb.....	55,154	13,003	42,151	324.16
	Los Angeles, Cal.....	50,395	11,183	39,212	350.64
	Manchester, N. H.....	44,126	32,630	11,496	35.23
	Mobile, Ala.....	31,076	29,132	1,944	6.67
	New Bedford, Mass.....	40,733	26,845	13,888	51.73
	Peoria, Ill.....	41,024	29,259	11,765	40.21
	Portland, Me.....	36,425	33,810	2,615	7.73
	Portland, Ore.....	46,385	17,577	28,808	163.90
	Salt Lake, Utah.....	44,843	20,768	24,075	115.92
	Savannah, Ga.....	43,189	30,709	12,480	40.64
	Somerville, Mass.....	40,152	24,933	15,219	61.04
	Springfield, Mass.....	44,179	33,340	10,839	32.61
	Utica, N. Y.....	44,007	33,914	10,093	29.76
	Wheeling, W. Va.....	34,522	30,737	3,785	12.31
	Wilkesbarre, Penn.....	37,718	23,339	14,379	61.61
Class X.					
Cities 25,000 to 30,000	Altoona, Penn.....	30,337	19,710	10,627	53.92
	Augusta, Ga.....	33,300	21,891	11,409	52.12
	Binghampton, N. Y.....	35,005	17,317	17,688	102.14
	Dubuque, Ia.....	30,311	22,254	8,057	36.20
	Elmira, N. Y.....	30,893	20,541	10,352	50.40
	Galveston, Tex.....	29,084	22,248	6,836	30.73
	Holyoke, Mass.....	35,637	21,915	13,722	62.61
	Lancaster, Penn.....	32,011	25,769	6,242	24.22
	Norfolk, Va.....	34,871	21,966	12,905	58.75
	Quincy, Ill.....	31,494	27,268	4,226	15.50
	Saginaw, Mich.....	46,322	10,525	35,797	340.11
	Salem, Mass.....	30,801	27,563	3,238	11.75
	San Antonio, Tex.....	37,673	20,550	17,123	83.32
	Springfield, O.....	31,895	20,730	11,165	53.86
	Terra Haute, Ind.....	30,217	26,042	4,175	16.03
	Yonkers, N. Y.....	32,033	18,892	13,141	69.66

GROWTH OF CITIES.—Continued.

Classification.	Cities in Group.	Population.		Increase.	
		1890.	1880.	Number.	Per Cent.
Class XI. Cities 20,000 to 25,000	Akron, O.....	27,601	16,512	11,089	67.16
	Allentown, Penn.....	25,228	18,063	7,165	39.67
	Auburn, N. Y.....	25,858	21,924	3,934	17.94
	Bay City, Mich.....	27,839	20,693	7,146	34.53
	Brockton, Mass.....	27,294	13,608	13,686	100.57
	Burlington, Ia.....	22,565	19,450	3,115	16.02
	Chattanooga, Tenn....	29,100	12,892	16,208	125.72
	Chelsea, Mass.....	27,909	21,782	6,127	28.13
	Cohoes, N. Y.....	22,509	19,416	3,093	15.93
	Dallas, Tex.....	38,067	10,358	27,709	267.51
	Davenport, Ia.....	26,872	21,831	5,041	23.09
	Gloucester, Mass.....	24,651	19,329	5,322	27.53
	Haverhill, Mass.....	27,412	18,472	8,940	48.40
	Houston, Tex.....	27,557	16,513	11,044	66.88
	Kansas City, Kan.....	38,316	3,200	35,116	1097.38
	Lewiston, Me.....	21,701	19,083	2,618	13.72
	Long Island City, N. Y.	30,506	17,129	13,377	78.10
	Newburg, N. Y.....	23,087	18,049	5,038	27.91
	Newport, Ky.....	24,918	20,433	4,485	21.95
	Newton, Mass.....	24,379	16,995	7,384	43.45
	Owego, N. Y.....	21,842	21,116	726	3.44
	Pawtucket, R. I.....	27,633	19,030	8,603	45.21
	Petersburg, Va.....	22,680	21,656	1,024	4.73
	Poughkeepsie, N. Y....	22,206	20,207	1,999	9.89
	Sacramento, Cal.....	26,386	21,420	4,966	23.18
	Seattle, Wash.....	42,837	3,533	39,304	1112.48
	Sionx City, Ia.....	37,806	7,366	30,440	413.25
	Springfield, Ill.....	24,963	19,743	5,220	26.44
	Taunton, Mass.....	25,448	21,213	4,235	19.96
	Topeka, Kan.....	31,007	15,452	15,555	100.67
	Waterbury, Conn.....	28,646	17,806	10,840	60.88
	Williamsport, Penn....	27,132	18,934	8,198	43.30
	Youngstown, O.....	33,220	15,435	17,785	115.23
Class XII. Cities 17,000 to 20,000	Bangor, Me.....	19,103	16,856	2,247	13.33
	Bloomington, Ill.....	20,484	17,180	3,304	19.23
	Canton, O.....	26,189	12,258	13,931	113.65
	Chester, Penn.....	20,226	14,997	5,229	34.87
	Council Bluffs, Ia.....	21,474	18,063	3,411	18.88
	Fitchburg, Mass.....	22,037	12,429	9,608	77.30
	Jackson, Mich.....	20,798	16,105	4,693	29.14
	Joliet, Ill.....	23,264	11,657	11,607	99.57
	Kingston, N. Y.....	21,261	18,344	2,917	15.90
	Lacrosse, Wis.....	25,090	14,505	10,585	72.97
	Leavenworth, Kan.....	19,768	16,546	3,222	19.47
	Lexington, Ky.....	21,567	16,656	4,911	29.48
	Little Rock, Ark.....	25,874	13,138	12,736	96.94
	Lincoln, R. I.....	20,355	13,765	6,590	47.88
	Lynchburg, Va.....	19,709	15,959	3,750	23.50

GROWTH OF CITIES.—*Continued.*

Classification.	Cities in Group.	Population.		Increase.	
		1890.	1880.	Number.	Per Cent.
Class XII. Continued.	Macon, Ga.....	22,746	12,749	9,997	78.41
	Malden, Mass.....	23,031	12,017	11,014	91.65
	Meriden, Conn.....	21,652	15,540	6,112	39.33
	Montgomery, Ala.....	21,883	16,713	5,170	30.93
	New Albany, Ind.....	21,059	16,423	4,636	28.23
	New Brunswick, N. J.....	18,603	17,166	1,437	8.37
	Newport, R. I.....	19,457	15,693	3,764	23.99
	Oshkosh, Wis.....	22,836	15,748	7,088	45.01
	Racine, Wis.....	21,014	16,031	4,983	31.08
	Rockford, Ill.....	23,584	13,129	10,455	79.63
	Sandusky, O.....	18,471	15,838	2,633	16.62
	South Bend, Ind.....	21,819	13,280	8,539	64.30
	Tacoma, Wash.....	36,006	1,098	34,908	3179.23
	Wilmington, N. C.....	20,056	17,350	2,706	15.60
	Woonsocket, R. I.....	20,830	16,050	4,780	29.78
	York, Penn.....	20,793	13,940	6,853	49.16
	Zanesville, O.....	21,009	18,113	2,896	15.99
Class XIII.					
Cities 14,000 to 17,000	Atchison, Kan.....	13,963	15,105	α 1,142	α 7.56
	Aurora, Ill.....	19,688	11,873	7,815	65.82
	Bayonne, N. J.....	19,033	9,372	9,661	103.08
	Birmingham, Ala.....	26,178	3,066	23,092	748.28
	Cedar Rapids, Ia.....	18,020	10,104	7,916	78.35
	Concord, N. H.....	17,004	13,843	3,161	22.83
	Duluth, Minn.....	33,115	838	32,277	3851.67
	Fort Worth, Tex.....	23,076	6,663	16,413	246.33
	Hamilton, O.....	17,565	12,122	5,443	44.90
	Johnstown, Penn.....	21,805	8,380	13,425	160.20
	Kalamazoo, Mich.....	17,853	11,937	5,916	49.56
	Knoxville, Tenn.....	22,535	9,693	12,842	132.49
	Lafayette, Ind.....	16,243	14,860	1,383	9.31
	Lockport, N. Y.....	16,038	13,522	2,516	18.61
	McKeesport, Penn.....	20,741	8,212	12,529	152.57
	Muskegon, Mich.....	22,702	11,262	11,440	101.58
	Nashua, N. H.....	19,311	13,397	5,914	44.14
	New Brighton, N. J.....	16,423	12,679	3,744	29.53
	New Britain, Conn.....	16,519	11,800	4,719	39.99
	Norristown, Penn.....	19,791	13,063	6,728	51.50
	Norwalk, Conn.....	17,747	13,986	3,791	27.16
	Norwich, Conn.....	16,156	15,112	1,044	6.91
	Orange, N. J.....	18,844	13,207	5,637	42.68
	Pittsfield, Mass.....	17,281	13,364	3,917	29.31
	Richmond, Ind.....	16,608	12,742	3,866	30.34
	San Jose, Cal.....	18,060	12,567	5,493	43.71
	Schenectady, N. Y.....	19,902	13,655	6,247	45.75
	Springfield, Mo.....	21,850	6,522	15,328	235.02
	Waltham, Mass.....	18,707	11,712	6,995	59.73
	Warwick, R. I.....	17,761	12,164	5,597	46.01
	Wichita, Kan.....	23,853	4,911	18,942	385.71
	Winona, Minn.....	18,208	10,208	8,000	78.37

α Decrease.

GROWTH OF CITIES.—Continued.

Classification.	Cities in Group.	Population.		Increase.	
		1890.	1880.	Number.	Per Cent.
Class XIV.					
Cities 13,000 to 14,000	Alexandria, Va.....	14,339	13,659	680	4.98
	Amsterdam, N. Y.....	17,336	9,466	7,870	83.14
	Belleville, Ill.....	15,361	10,683	4,678	43.79
	Biddeford, Me.....	14,443	12,651	1,792	14.16
	Columbus, Ga.....	17,303	10,123	7,180	70.93
	Decatur, Ill.....	16,841	9,547	7,294	76.40
	Easton, Penn.....	14,481	11,924	2,557	21.44
	Eau Claire, Wis.....	17,415	10,119	7,296	72.10
	Elgin, Ill.....	17,823	8,787	9,036	102.83
	Galesburg, Ill.....	15,264	11,437	3,827	33.46
	Keokuk, Ia.....	14,101	12,117	1,984	16.37
	Key West, Fla.....	18,080	9,890	8,190	82.81
	Newburyport, Mass.....	13,947	13,538	409	3.02
	North Adams, Mass.....	16,074	10,191	5,883	57.73
	Northampton, Mass.....	14,990	12,172	2,818	23.15
	Pottsville, Penn.....	14,117	13,253	864	6.52
	Pueblo, Cal.....	24,558	3,217	21,341	663.38
	Quincy, Mass.....	16,723	10,570	6,153	58.21
	Rome, N. Y.....	14,991	12,194	2,797	22.94
	Shenandoah, Penn.....	15,944	10,147	5,797	57.13
	Stamford, Conn.....	15,700	11,297	4,403	38.97
Class XV.					
Cities 12,000 to 13,000	Austin, Tex.....	14,575	11,013	3,562	32.34
	Burlington, Vt.....	14,590	11,365	3,225	28.38
	Chicopee, Mass.....	14,050	11,286	2,764	24.49
	Columbia, S. C.....	15,353	10,036	5,317	52.98
	Dover, N. H.....	12,790	11,687	1,103	9.44
	East St. Louis, Ill.....	15,169	9,185	5,984	65.15
	Fond du Lac, Wis.....	12,024	13,094	a 1,070	a 8.17
	Jacksonville, Fla.....	17,201	7,650	9,551	124.85
	Jamestown, N. Y.....	16,038	9,357	6,681	71.40
	Leadville, Col.....	10,384	14,820	a 4,436	a 29.93
	Logansport, Ind.....	13,328	11,198	2,130	19.02
	New London, Conn.....	13,757	10,537	3,220	30.56
	Portsmouth, Va.....	13,268	11,390	1,878	16.49
	Rock Island, Ill.....	13,634	11,659	1,975	16.94
	Steubenville, O.....	13,394	12,093	1,301	10.76
	Stockton, Cal.....	14,424	10,282	4,142	40.28
	Vicksburg, Miss.....	13,373	11,814	1,559	13.20
	Watertown, N. Y.....	14,725	10,697	4,028	37.66
	Woburn, Mass.....	13,499	10,031	2,568	23.49
XVI.					
Cities 11,000 to 12,000	Chillicothe, O.....	11,288	10,938	350	3.20
	Clinton, Ia.....	13,619	9,052	4,567	50.45
	Cumberland, Md.....	12,729	10,693	2,036	19.04
	Edgewater, N. Y.....	14,265	8,044	6,221	77.34
	Findlay, O.....	18,553	4,633	13,920	300.45
	Hannibal, Mo.....	12,857	11,074	1,783	16.10
	Jacksonville, Ill.....	12,935	10,927	2,008	18.38
	Lebanon, Penn.....	14,664	8,778	5,886	67.05

a Decrease.

GROWTH OF CITIES.—Continued.

Classification.	Cities in Group.	Population.		Increase.	
		1890.	1880.	Number.	Per Cent.
Class XVI. Continued.	Lima, O.....	15,981	7,567	8,414	111.19
	Madison, Wis.....	13,426	10,324	3,102	30.05
	Mansfield, O.....	13,473	9,859	3,614	36.06
	Marlboro, Mass.....	13,805	10,127	3,678	36.32
	Newark, O.....	14,270	9,600	4,670	48.65
	Ogdensburg, N. Y.....	11,562	10,341	1,321	12.77
	Ottumwa, Ia.....	14,001	9,004	4,997	55.50
	Port Huron, Mich.....	13,543	8,883	4,660	52.46
	Portsmouth, O.....	12,394	11,321	1,073	9.48
	Rutland, Vt.....	11,760	12,149	<i>a</i> 389	<i>a</i> 3.20
	Sedalia, Mo.....	14,068	9,561	4,507	47.14
	Shamokin, Penn.....	14,403	8,184	6,219	75.99
	Sheboygan, Wis.....	16,359	7,314	9,045	123.67
Class XVII. Cities 10,000 to 11,000	Auburn, Me.....	11,250	9,555	1,695	17.74
	Battle Creek, Mich.....	13,197	7,063	6,134	86.85
	Bridgeton, N. J.....	11,424	8,722	2,702	30.98
	Brookline, Mass.....	12,103	8,057	4,046	50.22
	Gloversville, N. Y.....	13,864	7,133	6,731	94.36
	Ithaca, N. Y.....	11,079	9,105	1,974	21.68
	Lansing, Mich.....	13,102	8,319	4,783	57.49
	Marquette, Mich.....	12,812	6,930	5,882	84.88
	Middletown, N. Y.....	11,977	8,494	3,483	41.01
	New Castle, Penn.....	11,000	8,418	3,182	37.80
	Ogden, Utah.....	14,889	6,069	8,820	145.33
	Paducah, Ky.....	12,797	8,036	4,761	59.25
	Raleigh, N. C.....	12,678	9,265	3,413	36.84
	Saratoga Springs, N. Y.....	11,975	8,421	3,554	42.20
	Spokane, Wash.....	19,922	350	19,572	5592.00
	Stillwater, Minn.....	11,260	9,055	2,205	24.35
	Waco, Tex.....	14,445	7,295	7,150	98.01
	West Troy, N. Y.....	12,967	8,820	4,147	47.02
Class XVIII. Cities 9,000 to 10,000	Weymouth, Mass.....	10,866	10,570	296	2.80
	Alpena, Mich.....	11,283	6,153	5,130	83.37
	Alton, Ill.....	10,294	8,975	1,319	14.70
	Appleton, Wis.....	11,869	8,005	3,864	48.27
	Atlantic City, N. J.....	13,055	5,477	7,578	138.36
	Augusta, Me.....	10,527	8,665	1,862	21.49
	Beverly, Mass.....	10,821	8,456	2,365	27.97
	Bradford, Penn.....	10,514	9,197	1,317	14.32
	Cairo, Ill.....	10,324	9,011	1,313	14.57
	Carbondale, Penn.....	10,833	7,714	3,119	40.43
	Charlotte, N. C.....	11,557	7,094	4,463	62.91
	Clinton, Mass.....	10,424	8,029	2,395	29.83
	Columbia, Penn.....	10,599	8,312	2,287	27.51
	Danville, Ill.....	11,491	7,733	3,758	48.60
	Elkhart, Ind.....	11,360	6,953	4,407	63.38
	Flint, Mich.....	9,803	8,409	1,394	16.58
	Freeport, Ill.....	10,189	8,516	1,673	19.65

a Decrease.

GROWTH OF CITIES.—Continued.

Classification.	Cities in Group.	Population.		Increase.	
		1890.	1880.	Number.	Per Cent.
Class XVIII.					
Continued.	Greenwich, Conn.....	10,131	7,892	2,239	28.37
	Hazleton, Penn.....	11,872	6,935	4,937	71.19
	Hornellsville, N. Y.....	10,998	8,195	2,801	34.18
	Hudson, N. Y.....	9,970	8,670	1,300	14.99
	Ironton, O.....	10,939	8,857	2,082	23.51
	Janesville, Wis.....	10,836	9,018	1,818	20.16
	Jeffersonville, Ind.....	10,666	9,357	1,309	13.99
	Lawrence, Kan.....	9,997	8,510	1,487	17.47
	Mahanoy, Penn.....	11,288	7,181	4,105	57.16
	Meadville, Penn.....	9,520	8,960	660	7.45
	Medford, Mass.....	11,079	7,573	3,506	46.30
	Michigan City, Ind.....	10,776	7,366	3,410	46.29
	Milford, Mass.....	8,780	9,310	α 530	α 5.69
	Moline, Ill.....	12,000	7,800	4,200	53.85
	Muskatine, Ia.....	11,454	8,295	3,159	38.08
	Oil City, Penn.....	10,932	7,315	3,617	49.45
	Passaic, N. J.....	13,028	6,532	6,496	99.45
	Peabody, Mass.....	10,158	9,028	1,130	12.52
	Pensacola, Fla.....	11,750	6,845	4,905	71.66
	Plainfield, N. J.....	11,267	8,125	3,142	38.67
	Port Jervis, N. Y.....	9,327	8,678	649	7.48
	Portsmouth, N. H.....	9,827	9,690	137	1.41
	Pottstown, Penn.....	13,285	5,305	7,980	150.42
	San Diego, Cal.....	16,150	2,637	13,522	512.78
	Shreveport, La.....	11,979	8,009	3,970	49.57
	Tiffin, O.....	10,801	7,879	2,922	37.00
	Virginia City, Nev.....	8,511	10,917	α 2,406	α 22.04
	West Bay City, Mich....	12,981	6,397	6,584	102.92
Class XIX.					
Cities 8,000 to 9,000	Adrian, Mich.....	8,756	7,849	907	11.56
	Alameda, Cal.....	11,165	5,708	5,457	95.60
	Ann Arbor, Mich.....	9,431	8,061	1,370	17.00
	Bath, Me.....	8,723	7,874	849	10.78
	Baton Rouge, La.....	10,478	7,197	3,281	45.59
	Beatrice, Neb.....	13,836	2,447	11,389	465.43
	Bellaire, O.....	9,934	8,025	1,909	23.79
	Danville, Va.....	10,305	7,526	2,779	36.93
	Dunkirk, N. Y.....	9,416	7,248	2,168	29.91
	East Liverpool, O.....	10,956	5,568	5,388	96.77
	Fort Scott, Kan.....	11,946	5,372	6,574	122.38
	Frederick, Md.....	8,193	8,659	α 466	α 5.38
	Green Bay, Wis.....	9,069	7,464	1,605	21.50
	Hagerstown, Md.....	10,118	6,627	3,491	52.68
	Hastings, Neb.....	13,584	2,817	10,767	382.22
	Helena, Mont.....	13,834	3,624	10,210	281.73
	Hyde Park, Mass.....	10,193	7,068	3,105	43.81
	Ishpeming, Mich.....	11,197	6,039	5,158	85.41
	Joplin, Mo.....	9,943	7,038	2,905	41.28
	Lansingburg, N. Y.....	10,550	7,432	3,118	41.95

α Decrease.

GROWTH OF CITIES.—*Concluded.*

Classification.	Cities in Group.	Population.		Increase.	
		1890.	1880.	Number.	Per Cent.
Class XIX. Continued.	La Salle, Ill.....	9,855	7,847	2,008	25.59
	Madison, Ind.....	8,936	8,945	α 9	α 0.10
	Massillon, O.....	10,092	6,836	3,256	47.63
	Millville, N. J....	10,002	7,660	2,342	30.57
	Muncie, Ind.....	11,345	5,219	6,126	117.38
	Natchez, Miss.....	10,101	7,058	3,043	43.11
	Natick, Mass.....	9,118	8,479	639	7.54
	Ottawa, Ill.....	9,985	7,834	2,151	27.46
	Owensboro, Ky.....	9,837	6,231	3,606	57.87
	Peekskill, N. Y.....	9,676	6,893	2,783	40.37
	Pittston, Penn.....	10,302	7,472	2,830	37.87
	Roanoke, Va.....	16,159	669	15,490	2315.40
	Spencer, Mass.....	8,747	7,466	1,281	17.16
	Streator, Ill.....	11,414	5,167	6,257	121.33
	Titusville, Pa.....	8,073	9,046	α 973	α 10.76
	Union, N. J.....	10,643	5,840	4,794	81.96
	Vincennes, Ind.....	8,853	7,680	1,173	15.27
	Watertown, Wis.....	8,755	7,883	872	11.06
	Westfield, Mass.....	9,805	7,587	2,218	29.23

α Decrease.

THE VITAL STATISTICS OF AN APACHE INDIAN COMMUNITY.

The *Boston Medical and Surgical Journal* of July 6, 1893, contains an interesting and unique contribution to vital statistics by W. C. Borden, M.D., Captain, Medical Department, U. S. Army. In this article Dr. Borden furnishes the vital statistics of a tribe of warlike Indians, who have been conquered, and removed from Arizona and the adjacent parts in Old and New Mexico to captivity in Florida and Alabama. The sudden change from a roving life on dry, arid plains to confinement in a humid and debilitating country furnishes some interesting scientific results.

The Indian statistics collected by Dr. Borden cover a period of five years from July, 1887, to June, 1892. The community consists of about four hundred men, women, and children from different tribes of the Apache nation stationed at Mt. Vernon Barracks, Alabama. The notorious hostility of the Apache Indians, and their non-affiliation with others, have kept the community remarkably free from foreign blood.

The Indians were brought from Arizona in 1886, and were confined in Fort Marion and Fort Pickens, Florida. In 1887 they were removed to Mt. Vernon Barracks, Alabama. Their quarters at all of these places were very unfavorable. At Mt. Vernon Barracks they lived in small, poorly ventilated cabins, which were situated in a low, damp hollow, so shaded by the trees that sunlight could barely penetrate. The Indians, accustomed to an active and a roving life, were unable to take care of themselves under such altered conditions, and they soon became demoralized, both mentally and physically. In 1891, however, they were given new quarters, and in a more sanitary location. At the same time the men were enlisted in the army, or were employed at paid labor about the garrison or village. This was a great improvement in all ways.

The effect of these various changes may be seen in part from the following statistics. It would be interesting and instructive to compare the figures of this five-year period with those of the Apache nation under normal conditions. As there are no such statistics, however, the differences can only be inferred. The following table shows the yearly condition of the community for the entire period:—

Year.	Mean Number Present.				Deaths.				Births.			Death Rate Per 1000.	Birth Rate Per 1000.
	Men.	Women.	Children (Under 12).	Total.	Men.	Women.	Children (Under 12).	Total.	Males.	Females.	Total.		
1887-88	78	170	118	366	1	11	8	20	9	8	17	54.64	46.44
1888-89	86	179	123	388	2	7	10	19	7	10	17	48.96	43.66
1889-90	92	176	124	392	6	13	24	43	6	28	34	109.69	86.73
1890-91	99	165	107	371	9	11	33	53	10	8	18	142.58	48.51
1891-92	122	169	119	410	10	11	24	45	16	15	31	109.75	75.61
Totals					28	53	90	180	48	69	117		

The most striking features of this table are the excessively high birth and death rates. For the former Dr. Borden gives two main causes. One of these is the great freedom of union between the sexes; the other is the practice of polygamy. These two facts are sufficient to explain why the birth rate is so high, while the number of men is so much smaller than that of the women. When the women approach the menopause the men take younger wives, and thus all of the women have as great a chance to bear children as there would be in a civilized community where the sexes are equal in number. In comparing this birth rate with that of a civilized community, therefore, it must be borne in mind that in such a polygamous state the number of births would remain constant. An increase of men would not increase the number of births, but would decrease the birth rate.

The death rate for the five years was even higher than the birth rate. The chief causes of death are shown in the following summary:—

Causes of Death.	Number of Deaths Each Year.					Total for 5 Years.	Per Cent.
	1887-88	1888-89	1889-90	1890-91	1891-92		
Tuberculosis.....	11	4	18	18	27	78	43.33
Acute diarrhœa.....	....	3	7	13	3	26	14.44
Chronic diarrhœa.....	1	1	5	4	2	13	7.22
Mal-nutrition (children).....	....	1	3	5	1	10	5.55
Other causes.....	8	10	10	13	12	53	29.46

Among the other causes of death were old age, peritonitis, pneumonia, croup, etc.

Thirty-two of the 39 deaths from diarrhoeal complaints were children. Infant mortality is comparatively high in civilized countries, and it is not extraordinary that it should be high in this community, for the children, after being weaned, are fed upon adult food at once. This was true, of course, during the normal life of these people, but under the changed conditions the food of the adults was extremely poor, because the Indians did not know how to keep and prepare it. Infant mortality, therefore, must have been greater than during the roving life of the Apache nation.

It is quite probable that the high death rate from tuberculosis is due to the altered mode of life. From a free life in a dry, rarefied atmosphere the Indians were brought to a life of confinement in a moist atmosphere, and in a debilitating climate. Such a great change can be safely brought about only by gradual adaptation, and Dr. Borden states that tuberculosis is a result of the sudden change.

The various forms of tuberculosis varied with age. For example, pulmonary tuberculosis affected men and women about equally, while children suffered less. Enteric and meningal tuberculosis, on the other hand, affected children almost exclusively. These diseases increased steadily during the five years, and the number of deaths was greater for the last year than for any year previous, in spite of the improved surroundings. If the number of deaths from these causes can be decreased as time goes on, the efficiency of modern sanitary measures, and the adaptibility of a race to an entirely new environment will be proved. It is to be hoped that further statistics may be forthcoming on this interesting subject.

G. N. C.

AMERICAN STATISTICAL ASSOCIATION.

NEW SERIES, No. 24.

DECEMBER, 1893.

STATISTICAL DATA FOR THE STUDY OF THE ASSIMILATION OF RACES AND NATIONALI- TIES IN THE UNITED STATES.

BY RICHMOND MAYO-SMITH.

In the philosophy of history, and in the more modern science of politics, we meet constantly with references to the influence of race and nationality on the institutions and history of certain peoples. The inference seems to be that certain institutions are due to the character or peculiarities of certain races; for instance, that local self-government, whether found in England, in the United States, in Canada, in Australia, or in the Cape Colony, may safely be ascribed to the influence of the Anglo-Saxons.

This principle is based upon the evidence of history and the comparative study of institutions. The evidence, however, is necessarily of a vague and general character. It consists mainly in the fact that we find people going out from the same mother-land carrying with them and perpetuating the same general form of institution. But it is impossible to say exactly how much the institutions are really due to the character of the people, and how much they are simply manifestations of the same social circumstances.

A similar lack of precision but confidence in generalization is seen in the customary historical analysis of the mixing of two races. Certain national habits and customs are attributed to the one race, and certain ones to the other race. Sometimes there is a division of the social organization, some institutions, it being asserted, being due to one race, and certain other institutions to the other. But the distance of these events, and the lack of exact information as to the number and distribution of the population, make any close analysis of the influence of national characteristics impossible.

In modern times the remarkable influx of men of different nationalities and races into the United States, and their settling side by side, suggests the inquiry whether we are not in a position to analyze to better advantage than ever before the effect of race character upon institutions and of races upon each other. The advantages that we enjoy for this study at the present time are three-fold:—

(1) The nations of Europe during the last fifteen hundred years have by constant rivalry and contest developed real national characteristics which they bring with them to America. (2) In America these different nationalities are subjected to the same conditions, and occupy the same position of equality. Each nationality, therefore, has a chance to make its characteristic dominant. (3) We have a statistical basis for this study in the census enumeration of persons of foreign birth and of foreign parentage, and their distribution.

The purpose of this paper is to determine the statistical data which bear upon these questions, and their respective validity. The ultimate purpose of the whole inquiry is to determine whether the controlling factors in the resultant of the mixture of different nationalities or races are: (1) Race character, (2) physical environment, or (3) social influences.

In this brief synopsis it is impossible to go into all the details, but the general course of the inquiry is as follows:—

We must conceive of the history of the United States as a

gradual but continuous process of mixture and assimilation of men of different races and nationalities. The process is not yet complete, and it is due to this very fact that we are still able to analyze and to study it. For our statistics show us sections of the population composed in varying proportions of men of different nationalities; and our study of institutions shows us the institutions belonging to these same populations. By comparison of the likenesses or differences between the two, we may detect variations which may be ascribed to the influence of race.

We must remark, however, that in the history of the population of the United States it is necessary to make allowance for two great influences which have always been present, and which at the beginning were quite overwhelming in giving an impress to the colonists from whatever nationality they may have come. The first of these was the effect of settlement in an entirely new country, so far from the mother-country as to be practically free from her influence, and so exposed to danger that it demanded extraordinary courage and self-reliance. Here was an influence of environment demanding the development of certain qualities at all cost, even on penalty of annihilation. With the extension of colonization westward the same qualities were demanded, and have even in recent times been made manifest in the mining camps, and on the cattle ranges of the far West, just as they were in the earliest settlements.

The second influence, and one which has been permanent and powerful, is that of established institutions. Owing to the fact that the majority of the early settlers were English, and that the immigration at first was extremely moderate, time was given to fix the institutions on the English model. Later immigration from many different nations has been received into the mould thus prepared, and, not having the cohesion necessary for separate existence, has taken on this form. The intermixture of races caused by the immigration of the nineteenth century, unlike that of former

times, has not been due to a war of nationalities ; it has been the absorption by a nationality of individuals from other nations. It has been an unequal contest of the individual immigrants against powerfully established national customs and firmly rooted institutions. This influence became especially powerful with the establishment of our national government, and has remained powerful ever since.

Such being the great controlling influences which have tended to keep all the elements introduced into this country within the bounds, so to speak, of American development, we may ask what movement has been going on within these limits. This movement, in my opinion, may be studied under three aspects.

There has been, in the first place, an assimilation, an intermixture of the natives (first comers) and the foreigners (late comers), which has resulted in a population unlike either the native-born American, or the foreign born of any one nationality.

In the second place, there may have been a change in the character of the foreign-born element, owing to its subjection to new influences.

In the third place, there may have been direct influence exerted on the native character by the presence of the new foreign element. The question now is whether we can get any statistical data enabling us to determine the strength of these three influences.

INFLUENCES TENDING TO ASSIMILATE THE FOREIGN AND THE NATIVE ELEMENTS IN THE UNITED STATES.

The problem we have before us here is to determine whether the conditions now prevailing in the population of the United States are favorable to assimilation ; how far the process has probably gone ; and whether we can distinguish the results of the process.

Our first step is to determine the elements of the popula-

tion. For this purpose the Eleventh Census gives us the following classification : —

TABLE I.—POPULATION OF THE UNITED STATES ACCORDING TO COLOR, BIRTH-PLACE, AND PARENTAGE.

Total population.....	62,622,250	100.00 per cent.
Colored population.....	7,638,360	12.20 “
Native White, native parents.....	34,358,348	54.87 “
Native White, foreign parents.....	11,503,675	18.37 “
Foreign White.....	9,121,867	14.56 “
Total of last two.....	20,625,542	32.93 “

We have here four different elements entering into the population of the United States. The native Americans, that is, the Native Whites, whose parents are native born, number a little over one-half of the total population. This, indeed, carries us back only one generation. The grandparents of these persons may have been, and probably were, in many cases, foreign born, so that it is safe to say that less than one-half of the people of the United States are descendants of the whites who were here at the beginning of this century. Upon this native American element is imposed three elements different either in race, or in birth-place, or in parentage. The first is the colored, 12.2 per cent of the total population, composed principally of negroes. They constitute a peculiar element in the American population, the importance of which is very great, but whose study differs from that of the foreign element for two reasons, viz., that color seems to be an effectual hindrance to marriage with the whites, and thus no amalgamation of blood will ever be possible; and their previous history gives them a peculiar position in American civilization. They are in many respects an inferior race, but they are native-born Americans, and the only civilization they know is American. Hence, they are not so much an alien element as a peculiar one, separated from the rest of the community by an ineradicable mark, and yet inseparably bound to the community.

The second element, 14.56 per cent of the whole, is com-

posed of white persons born abroad, that is, the survivors of the immigrants to this country. This is the element through whom the direct foreign influence, whether for good or for evil, upon the institutions and the people of this country is exercised. It is, therefore, extremely important to know what and how great this influence is. This is properly the question of the direct effect of immigration upon the United States, and will not be entered upon here. For our purpose it is important to know whether this element, foreign by birth, yields to the dissolving influence of American life, or whether it remains alien in character and influence.

The third element is constituted of native white persons whose parents were foreign born. They may be called the second generation of the immigrants. It is evident that there may be, and probably is, an important difference between these last two classes. The native-born whites of foreign parentage are not to be regarded entirely as foreigners. Born on this soil, reared in our community, educated in the public schools, they lose the quality of foreigners and acquire the characteristics of natives. It is true that where they are massed together this does not always happen, for they may then retain a foreign language and all the habits of their foreign parentage. But it is evident that unless thus massed the new generation will tend to disintegrate and assimilate itself more readily to the native Americans than did the original foreign-born ancestors.

The relative proportion of these three elements in the white population gives us an important indication of the influence of immigration in each state. For instance, in New England we have the following contrasts:—

TABLE II.—POPULATION OF MAINE AND OF MASSACHUSETTS.

	Maine.	Massachusetts.
Native Whites, native parents.....	76.75 per cent.	42.67 per cent.
Foreign-born Whites.....	11.90 “	29.19 “
Native Whites, foreign parents.....	11.17 “	17.09 “

We have here a very marked difference in the character of the population of two New England states. The problem of assimilating the foreign element would seem to be much more difficult in the case of Massachusetts than in the case of Maine. So, also, if difference in nationality has a very marked influence on institutions, one would expect to find the institutions and the legislation of the two states very different. These comparisons between neighboring states, or between different sections of the same state, might be carried out indefinitely, and I believe would be fruitful of results.

A second contrast seems to me even more important. This is the relative proportion in different communities of the second generation of immigrants to the first. It must be conceded that it is the children of the immigrants whom we expect to become fully Americanized. Where, therefore, this second generation is already large compared with the first, we may say that the process of assimilation is already begun, and has a good basis to work upon. On the other hand, where the foreign element is still composed mainly of the original immigrants, then we may say that the task of assimilation is still before us. In order to measure the relative strength of the second generation and the first, I have taken the proportion of native whites of foreign parents to the foreign-born whites in the principal states of the North Atlantic and the North Central divisions. The results are as follows:—

TABLE III.—PROPORTION OF NATIVE WHITES OF FOREIGN PARENTAGE TO FOREIGN-BORN WHITES.

The United States, . . .	126.11	Native Whites, Foreign Parents, to 100 Foreign Whites.						
North Atlantic Division, .	112.40	"	"	"	"	"	"	"
Maine,	93.86	"	"	"	"	"	"	"
New Hampshire, . . .	69.27	"	"	"	"	"	"	"
Vermont,	141.17	"	"	"	"	"	"	"
Massachusetts,	92.79	"	"	"	"	"	"	"
Rhode Island,	88.92	"	"	"	"	"	"	"
Connecticut,	105.38	"	"	"	"	"	"	"
New York,	117.35	"	"	"	"	"	"	"
New Jersey,	113.38	"	"	"	"	"	"	"
Pennsylvania,	126.43	"	"	"	"	"	"	"

North Central Division, . 138.35 Native Whites, Foreign Parents, to 100 Foreign Whites.

Ohio,	172.65	"	"	"	"	"	"	"
Indiana,	207.34	"	"	"	"	"	"	"
Illinois,	124.23	"	"	"	"	"	"	"
Michigan,	113.29	"	"	"	"	"	"	"
Wisconsin,	140.04	"	"	"	"	"	"	"
Minnesota,	110.93	"	"	"	"	"	"	"
Iowa,	158.42	"	"	"	"	"	"	"
Missouri,	186.82	"	"	"	"	"	"	"
North Dakota,	77.87	"	"	"	"	"	"	"
South Dakota,	120.22	"	"	"	"	"	"	"
Nebraska,	123.82	"	"	"	"	"	"	"
Kansas,	160.26	"	"	"	"	"	"	"

The results of this comparison are in some cases surprising. In most of the states the native whites of foreign parents are more numerous than the foreign born, that is, the second generation is more numerous than the first. This is true even of such states as Wisconsin and Minnesota, which we think of particularly as peopled by immigrants. On the other hand, in four of the New England states the second generation is not as numerous as the first. This seems to me to indicate that the eastern states have a more difficult task before them than the states of the northwest. Comparison between different states may be carried out indefinitely.

Having thus defined the relative proportions of the elements to be assimilated in the different parts of the United States, the next question is, what effect those influences which tend towards assimilation will have upon these elements, and with what prospect of success.

There are three forces tending towards assimilation: Inter-marriage, common-school education, and the exercise of political rights.

Inter-Marriage.

Assimilation by inter-marriage is the natural way of welding diverse nationalities or races into one nation. Thereby is brought about an actual intermixture of blood, and a community of customs and habits of life, which efface any previous differences. In course of time this assimilation will undoubtedly take place in the United States among the

foreign born whites, for there are no particularly strong national prejudices to be overcome, and the second and third generations will feel themselves more American than anything else. It is improbable that we shall ever be able to trace this statistically, for all these persons will be classified as native born, and the distinction of parentage will at best be carried back only one generation. But it is principally in the second and third generation that we are to seek this amalgamation by inter-marriage of Americans with persons of other nationality; for the immigrants who come here are either already married, or will naturally marry persons of the same race with whom they associate, and to whom they are drawn by language or by acquaintanceship.

The inquiry in regard to the parentage of persons shows us a certain number of mixed parentage. The Tenth Census made the interesting deduction that where a nationality was numerously represented in a locality there was little tendency for its members to marry natives or persons of another nationality. But where a nationality was not numerously represented there was a much greater tendency to marry with others. This deduction was confirmed by the Massachusetts Census of 1885, and the Eleventh Census will give us further opportunity to test it. It seems probable, however, that amalgamation by marriage will not be for the first two generations an assimilating force of any great importance.

Common-School Education.

This has always been regarded in the United States as perhaps the most important influence in converting the immigrants, many of them uneducated, some of them not even speaking the English language, into good American citizens.

The question for us is to determine statistically how far the foreign elements are receptive to this influence, and what the result has been. I shall be able barely to enumerate the different lines of inquiry.

The proportion of the immigrants who already speak Eng-

lish is important, for it is evident that they can more readily take advantage of our educational facilities than those who speak a foreign language. Out of 15,427,657 immigrants who arrived here from 1820 to 1890 about 40 per cent were put down as coming from Great Britain and Ireland, while 6.79 were put down as coming from British North America. This proportion of English-speaking immigrants is decreasing. In 1891 the proportion of immigrants from Great Britain and Ireland was less than 22 per cent of the total, and the immigrants from British North America overland were no longer reported.

A second fact of importance is whether the immigrants come from a country where the greater portion of the people have already received common-school education. In this respect we may contrast the Germans, Swedes, and Norwegians with the Italians, Hungarians, and Russians.

But a more important consideration seems to me to be whether the foreign element is composed of immigrants who are already too old to come under the influence of our education, or of the second generation who have been in our schools, or are in them now. The first element is represented by the 8,332,072 foreign-born persons in the United States above the school age. The second element is represented by the 11,503,675 native whites of foreign parentage who either have had or are now having the opportunity of education here. To these must be added the 917,475 foreign-born persons still of school age, making 12,521,150. This element I designate as the schooled and schoolable element. It is to be contrasted with the 8,332,072 unschooled, that is, who have never been submitted to the influence of education in this country. This classification is not applicable, of course, to individual cases, but it will give us a general notion of how far the foreign elements are capable of being influenced by our common-school system.

If we represent the foreign element beyond the school age by 100, the strength of the schooled and schoolable will be

represented by 151.39. The proportion is widely different in different parts of the country, and represents the greatest variety of problems offered by the presence of the foreign born. The general figure would seem to show that the foreign element is in a controllable position, a position where we can bring the influence of our educational system to bear upon it. The comparison of different states and different sections may be followed out as under the previous question.

The direct task imposed upon different states in the matter of education is shown by the total number of children of school age classified as of foreign birth, of native birth and foreign parentage, and of native birth, native parentage. The first element would seem to offer the greatest difficulty, and the last element the least.

The success of the states in meeting this demand is shown by the total enrollment of children in schools, which, according to the last census, was 14,373,670 out of a total of 18,543,207 children of 5 to 17 years of age.

The final success of our educational system must be shown by the statistics of illiteracy. Those for Massachusetts are very interesting as showing that illiteracy in that state is due almost entirely to the presence of the foreign born. They also show a large rate of illiteracy among the native born of foreign parents. This, however, is probably due to the large number of homeless and pauper children in that class. Altogether, education seems to be reaching the second generation.

The Influence of Political Life.

There is no doubt that the exercise of political rights has had a powerful effect in assimilating the men of different nationalities and making them feel like one nation. The policy of the United States in conferring upon persons, coming to this country with the intention of remaining, the same political rights which the native born enjoy has been founded not only upon the doctrine of the equality of men, but also upon the desire to bring all men into a unified body politic.

It is not our intention to discuss the question whether this policy has brought inconveniences or not, or whether we have been too liberal in extending political rights. We look at it simply from the point of view of the assimilating influence which has thereby been exercised. The statistical data for this purpose may be arranged under the following four heads:—

(1) What proportion of the foreign born is subjected to this assimilating influence of the exercise of political rights? In other words, how many of the foreign born are naturalized males?

If we look at the statistics of the proportion of foreign-born males of voting age, we shall find that it is greatly in excess of the proportion of the foreign-born persons to the whole population. For the whole United States the proportion is 25.67 per cent of total males 21 years and over; for the North Atlantic division it is 33.23 per cent; for the North Central division it is 30.97 per cent; in Minnesota it is 58.85 per cent.

This would seem to show that the voting strength of the foreign-born population is very great, in some of the states more than one-half of the total voting strength of the population. But it must be remembered that all these men are not capable of voting, because many of them have not been naturalized, either because they have not been in this country a sufficient length of time, or because they have no desire to exercise political rights. It is curious to see that in the Western states, where there is the greatest proportion of foreign born, there is also the greatest proportion of them naturalized, showing that the immigration is of an older date, or that the immigrants are more disposed to be naturalized than they are in the Eastern states.

In the whole of the United States only 58.55 per cent of the foreign born have been naturalized, that is, a little more than one-half. In the Western states this proportion ascends to 64.75 per cent, while in the Eastern states it is only 54.32.

TABLE IV.—SHOWING THE VOTING STRENGTH OF THE FOREIGN BORN IN THE UNITED STATES.

	Foreign-Born Males 21 Years and Over to 100 Males 21 Years and Over.	Naturalized to 100 Foreign-Born Males 21 Years and Over.	Naturalized For- eign-Born Males to 100 Males 21 Years and Over.
United States	25.67	58.55	15.02
North Atlantic Division	33.23	54.32	18.05
Maine.....	15.14	36.52	5.52
New Hampshire.....	22.05	38.90	8.57
Vermont.....	19.36	46.95	9.08
Massachusetts.....	38.66	43.76	16.91
Rhode Island.....	40.18	38.83	15.60
Connecticut.....	34.99	49.39	17.28
New York.....	38.73	60.74	23.52
New Jersey.....	35.08	60.30	21.15
Pennsylvania.....	27.19	53.19	14.46
North Central Division.....	30.97	64.75	20.05
Ohio.....	21.53	70.28	15.13
Indiana.....	12.33	75.90	9.35
Illinois.....	36.39	62.12	22.60
Michigan.....	40.22	58.76	23.63
Wisconsin.....	52.93	64.71	34.25
Minnesota.....	58.85	63.67	37.46
Iowa.....	29.92	68.89	20.61
Missouri.....	17.11	66.99	11.46
North Dakota.....	64.89	48.87	31.71
South Dakota.....	44.35	66.75	23.60
Nebraska.....	31.80	64.47	20.50
Kansas.....	19.07	69.37	13.22

In Indiana it is 75.90 per cent, in Ohio 70 per cent, in Kansas 69.37 per cent, in Iowa 68 per cent, while in none of these states, except Michigan and North Dakota, does it descend below 60 per cent. On the other hand, in the Eastern states it is between 36.52 per cent in Maine and 60.74 in New York. We find, therefore, that the proportionate number of foreign-born persons actually availing themselves of political rights is much greater in the West than in the East. This would seem to show that the assimilating influence has a better chance in the West than in the East.

(2) What is the real strength of the foreign vote in the

total vote? Is this strength sufficient to enable the foreign vote, if cast solidly, to exert an independent power?

This question is answered by giving the proportion of naturalized foreign-born males of voting age to the total number of males of voting age. These proportions are shown in the preceding table. In the whole of the United States the naturalized foreign-born males of voting age constitute 15.02 per cent of the total potential voting population; in the North Atlantic division, 18.05 per cent; in the North Central division, 20.05 per cent. The actual voting strength is, therefore, not very great. With the exception of three or four Western states, it is about one-fifth. In some of the Eastern states it is insignificant, and in no state has it an absolute majority. It does not seem probable, therefore, that there is any danger of the foreign vote being kept solidly together in such a way as to resist the dissolving influence of American political life. To do so would require very great influence among the leaders, and a similarity of aims among the different nationalities, which does not exist.

A comparison of the figures in the different states shows us a great variety of combinations. In some of them the voting strength is due to the large number of foreigners; in others it is due to the large proportion among the foreigners who are naturalized. For instance, in Pennsylvania only 27 per cent of the voters are foreign-born males, and in Rhode Island 40 per cent; but while in Rhode Island only 38 per cent are naturalized, in Pennsylvania 53 per cent are naturalized, so that the actual voting strength is nearly equal in Pennsylvania to what it is in Rhode Island. There is this difference, however, between the two states, that in Rhode Island the foreign vote may increase rapidly on account of the large number of unnaturalized foreigners, while in Pennsylvania the increase will be much slower.

The general effect of the varying percentage of the naturalized foreign-born males of voting age in the different states is to reduce the effective voting strength of the foreign born,

so that it bears about the same proportion to the whole voting strength as the total number of the foreign born bears to the total population.

TABLE V.—VOTING STRENGTH OF THE FOREIGN BORN IN UNITED STATES COMPARED WITH PROPORTION OF WHOLE POPULATION.

	Proportion of Naturalized Foreign Born to Total Males 21 Years and Over.	Foreign Born of Total Population.
The United States.....	15.02	14.56
North Atlantic Division.....	18.05	22.27
North Central Division.....	20.05	18.13
Minnesota.....	37.46	35.87
Wisconsin.....	34.25	30.77
North Dakota.....	31.71	44.52
South Dakota.....	29.60	27.63
Michigan.....	23.63	25.87
New York.....	23.52	26.11
Illinois.....	22.60	21.98
New Jersey.....	21.15	22.70
Nebraska.....	20.50	19.10
Connecticut.....	17.28	24.54
Massachusetts.....	16.91	29.19
Rhode Island.....	15.60	30.69
Ohio.....	15.13	12.49
Pennsylvania.....	14.46	16.04
Kansas.....	13.22	10.35
Missouri.....	11.46	8.74
Indiana.....	9.35	6.66
Vermont.....	9.08	13.24
New Hampshire.....	8.57	19.18
Maine.....	5.52	11.90

(3) Suppose we add the voters of the second generation of the foreign born to the naturalized foreign-born voters? It is sometimes said that we should include all the descendants in estimating the political strength of the foreign element.

In order to get at this figure we add together the native male whites of foreign parentage, 21 years and over, to the number of the naturalized foreigners. We thus get the foreign vote of two generations. Add to this the native male whites of native parentage, 21 years of age and over, and we

have the total actual white voting strength in the United States. The foreign vote of two generations bears a very large proportion to this total vote, as is seen in the following table:—

TABLE VI.—SHOWING STRENGTH OF FOREIGN VOTE OF TWO GENERATIONS TO TOTAL WHITE VOTE.

	Percentage of Foreign Vote of Two Generations to Total White Vote.	Proportion of Foreign Vote of Two Genera- tions to Native Ameri- can Vote, i. e., Native Whites, Native Percentage.
United States	34.77	53.32 to 100
North Atlantic Division.....	41.25	70.23 "
Maine.....	13.97	16.24 "
New Hampshire.....	17.32	20.92 "
Vermont.....	24.31	32.12 "
Massachusetts.....	41.29	70.33 "
Rhode Island.....	42.10	72.73 "
Connecticut.....	33.19	64.46 "
New York.....	52.46	110.38 "
New Jersey.....	44.54	80.31 "
Pennsylvania.....	34.42	52.49 "
North Central Division.....	41.39	70.62 "
Ohio.....	35.76	55.67 "
Indiana.....	22.72	29.40 "
Illinois.....	46.26	86.10 "
Michigan.....	48.26	93.28 "
Wisconsin.....	72.50	263.70 "
Minnesota.....	70.49	238.87 "
Iowa.....	41.84	71.45 "
Missouri.....	27.59	38.10 "
North Dakota.....	68.26	215.13 "
South Dakota.....	55.64	125.45 "
Nebraska.....	38.14	61.65 "
Kansas.....	26.68	36.40 "

In the whole of the United States the foreign vote of two generations is 34.77 per cent of the total vote. In the North Atlantic division it is 41.5 per cent; in the North Central division it is 41.39 per cent; in Wisconsin it is 72.5 per cent; in Kansas it is only 26.68 per cent. The different states show the widest possible contrasts. These contrasts are so great that it is absolutely impossible to believe that the foreign vote

of the two generations is solid. If that were so, two such states as Wisconsin and Kansas would certainly show us very marked differences in their political life. In New York the foreign vote of two generations is more than one-half of the total, while in Pennsylvania it is only one-third. Is there any indication of this in the condition of the two commonwealths? The obvious answer to these queries is that the second generation of voters have been subjected to the solvent influence of American educational and political institutions. It is an indication of the assimilating influence of American life that, where we have these striking differences in the constitution of the population of different states, we do not find corresponding differences in their political life. It needs but little exercise of the imagination to picture how radically and peculiarly these communities would differ from each other if the process of assimilation had not gone on, if the second, or even the first, generation had retained the habits, customs, and feelings of their native land. This same picture enables us to realize how powerful the assimilating force has been.

(4) The fourth arrangement of figures is intended to show the relation of the voters of the second generation to the naturalized foreign-born voters. For, if the second generation has felt the influence of American life, its strength, as compared to the foreign born, is a matter of great importance. We find in the United States that for every one hundred naturalized voters there are 84.45 native voters of foreign parentage. In the North Atlantic division the proportion is 90.23 per cent to 100. In the Western states it is not generally so great as in the Eastern, but even in Wisconsin there are 71.37 voters of the second generation to 100 of the first.

Such are the statistical data which may be of use to us in measuring the force of political privileges in assimilating different nationalities in this country. The process by which we shall study the use of these statistics belongs to the second part of this investigation.

TABLE VII.—SHOWING THE VOTING STRENGTH OF THE NATURALIZED FOREIGN BORN AND THE NATIVE BORN OF FOREIGN PARENTAGE.

	Relation Native Born Foreign Parentage Vote to Naturalized Vote.		Relation Native Born Foreign Parentage Vote to Naturalized Vote.
United States.....	84.45 to 100	North Central Division.....	79.45 to 100
North Atlantic Division....	90.23 “	Ohio.....	155.30 “
Maine.....	127.84 “	Indiana.....	130.36 “
New Hampshire.....	74.48 “	Illinois.....	73.16 “
Vermont.....	139.30 “	Michigan.....	68.51 “
Massachusetts.....	88.78 “	Wisconsin.....	71.37 “
Rhode Island.....	97.89 “	Minnesota.....	46.96 “
Connecticut.....	82.96 “	Iowa.....	82.13 “
New York.....	86.51 “	Missouri.....	114.23 “
New Jersey.....	74.20 “	North Dakota.....	43.30 “
Pennsylvania.....	102.34 “	South Dakota.....	59.45 “
		Nebraska.....	62.55 “
		Kansas.....	83.48 “

THE REACTIVE INFLUENCE ON THE IMMIGRANT OF COMING TO THIS COUNTRY.

It would be of importance for our purpose if we could determine whether transplanting to this country modifies the characteristics of the foreign-born population. Such modification might render the process of assimilation easier, or it might be such as to render the influence of the foreign born much smaller.

These statistics are very difficult and uncertain. It is impossible to indicate here more than the general line of investigation.

The reactive influence may be either physiological, economic, or social.

THE PHYSIOLOGICAL influence should be seen in a change in the birth rates, death rates, marriage rates, or sickness or disease rates. No exact statistics show as yet any of these things for the foreign born. We have only indirect evidence. It seems to me probable that the foreign born have no excessive death rate after coming to this country. From the

Massachusetts Census it seems probable that the foreign-born married women have a larger number of children than the native-born married women, but that a greater proportion of them die.

ECONOMIC EFFECT. The economic effect of the change of condition is probably very great. Two lines of inquiry would seem to be profitable in this connection. One is that the immigrants change their occupations after coming to this country. The great mass of them when they come are unskilled laborers. Among the foreign born in 1880 34.89 per cent were engaged in manufactures and mechanical and mining industry, 13.15 per cent in trade and transportation, 28.62 per cent in professional and personal services. The second fact is that while the immigrants are largely from agricultural districts the foreign born in this country are, 44.13 per cent of them, found in large cities. This change from rural to urban life must have some effect, and this effect might be traced back for the different nationalities.

SOCIAL EFFECTS. These can be traced out principally from the statistics of crime, pauperism, and illiteracy. I shall not enter into this subject except to say that from all the statistics the conclusion seems to be justified that criminality is somewhat more prevalent among the foreign born and those of foreign descent than among those of native descent, but this excess is not so great as to enable us to say that the influence of migration is to increase the tendency of crime.

TABLE VIII. — SHOWING PROPORTION OF FOREIGN-BORN ADULT PRISONERS AND OF FOREIGN-BORN ADULTS.

	Foreign-Born Male Prisoners of Total Male Prisoners.	Per Cent of Foreign-Born Males 18 Years of Age and Over of Total Males 18 Years of Age and Over.
United States.....	26.22	26.38
North Atlantic Division.....	31.69	32.21
South Atlantic Division.....	10.12	6.82
North Central Division.....	22.55	29.75
South Central Division.....	15.25	8.39
Western Division.....	32.18	36.07

The statistics of pauperism are more unfavorable to the foreign born, but this is natural considering that they are largely from among the lower classes.

The third division of this inquiry would be to trace the influence of the foreign born on the native American. Just as in the previous case, this influence might be such as to make the process of union easier, or it might be such as to render the influence of the native born much smaller.

These influences would, as in the previous case, be either physiological, economic, or social. The general line of inquiry would be the same, and in many cases the two inquiries would run into each other. This would be the case with the theory that immigration into this country has decreased the natural rate of growth among the native born. This can only be studied in connection with the previous question of the natural increase of the foreign born. So in the same way the economic influence is felt by the crowding in of the foreign born and the displacement of American labor. The effect of this may be either to drive American labor into higher occupations, or to force it to a lower plane of living. These inquiries are interesting and important. The statistics of pauperism do not seem to show that the competition of the foreign born has as yet had a fatal influence upon the natives. Social effects would require tracing out in the same way in the statistics of crime.

CONCLUSION.

It has been my intention to give in this paper simply an indication of the statistical data which I believe might be used to give us a better foundation for a theory of the mixture of nationalities and races than we yet have. I reserve for a second paper the consideration of what facts of observation should be brought into connection with these statistical data in order to give us the desired result. The method in this second part will be an investigation of the legislation and institutions of different states, with the view of ascertain-

ing if the varying proportion of the three elements of population which we have analyzed in this paper makes itself in any way felt. I have already, at various points in this paper, hinted at the way this comparison should be made, and I believe that we can already foreshadow certain general results as follows: —

(1) The process of assimilation is going on in this country, and is going on very effectually and rapidly, or else there would be differences between different communities, which would be obvious to the most superficial observation.

(2) Particular race or national character does not have a controlling and permanent influence on the institutions of this country, else we should find sections peopled by foreigners of different nationalities much more strongly marked by the peculiarities of those nationalities than we do.

(3) Physical environment does not seem to have an influence which can be distinctly traced on the institutions, except in the way of developing the same general character among the inhabitants, as mentioned in the introduction.

(4) The assimilating influences are principally social, that is, the influence of institutions already established, of the dominant language, and of the customs of the original inhabitants.

If these conclusions could in any degree be established, it would bring about an important modification in the sociological and philosophical theory of the influence of race character.

It would also have important practical consequences in teaching us what restrictions, if any, should be placed on immigration, and what influences should be especially encouraged for the purpose of developing a unified nationality in this country.

REPORT OF AN INTERNATIONAL MORTALITY STANDARD, OR MORTALITY INDEX.

BY JOSEPH KÖRÖSI. (BUDAPEST.)

1. *Disturbing Influence of Unequal Age Distribution on the Mortality Coefficient.*

The most correct standard of mortality is furnished by life tables, but on account of their intricacy they are seldom compiled. For ordinary statistical purposes the "death rate," although known to be inaccurate, is the usual measure of mortality; and every day we find, not only in newspapers, but also in scientific works, international comparisons of mortality based on these death rates.

The purpose of this paper is to determine whether it is possible to eliminate the errors connected with the usual calculation of the death rate, and thus to arrive at more reliable results.

The death rate gives the number of deaths among a certain number of inhabitants during the year.

Assuming that there occur 6000 deaths during a week in a country having ten millions of inhabitants, this would give for a year 312,000 deaths, and the death rate would be 31.2 per thousand inhabitants. If during another year, or in another country, this rate should rise to 40 per 1000, it would be generally assumed that the mortality had risen, and that by about one-third, the death rate being made use of to measure the sanitary conditions. This quality of the death rate could not be contested without denying all value to this standard. Wherefore establish a measure of mortality which is unable to measure it? But, although the same sanitary conditions exist in two localities, yet the death rate may be different. Take, for instance, two towns with 10,000 inhabitants each, A and B. If 10 per cent of the children and one per cent of the adults died in each of these towns during a

year, the sanitary conditions are the same in both places. And yet the death rate will differ as the number of children and adults differs, or, in other words, it will differ in accordance with the *distribution of ages*.

For instance, if A had 5000 children and 5000 adults, and B 2000 children and 8000 adults, the respective numbers of deaths would be as follows:—

	Children.	Adults.		
	Mortality 10 Per Cent.	Mortality 1 Per Cent.	Total.	
In A	500	50	550	55 per cent.
In B	200	80	280	28 " "

It will therefore be seen that the death rate not only depends upon the qualitative (sanitary) conditions of a country, which are the exclusively relevant ones, but is also influenced by a merely quantitative and thus quite irrelevant factor, that is, by the number of the more or less death-resisting elements. For it is evident that more children may be expected to die in a town in which their number is greater than in another* in which it is less, and that we therefore commit an error by confounding the frequency of deceased children with the greater vital danger of childhood.

2. *How to Eliminate the Influence of Unequal Age Distribution. (Standard Population.)*

If we take into consideration two towns with equal numbers of inhabitants, but differing in the number of children, it will at once be evident that in order to arrive at a correct estimate of the respective mortality in these towns the number of deaths, that is, the rough death rate, cannot be taken into consideration, but that we have to ask how this death rate would work out if the number of children had been the same in both. Common sense already tells us that a large number of children in a community points to a great vitality in its inhabitants, and that therefore if the death rate, as

* See page 305 of my Report at the Vienna session of this Institute, *Bulletin*, v. VI, Part 2.

shown in the case of A and B, gives a reverse result, this is irrational.

To arrive, therefore, at correct statistical results it is necessary to compare not the rough death rate of the total populations, but the special death rates of the various age classes. But in statistics it is necessary to represent the mortality of a whole country in *one* figure. It is not enough for us to know that in Paris, for instance, the mortality of children under one year of age is less than in London, that the mortality of children up to five years of age is greater, and that the age classes from 10 to 15 years are equally endangered in both cities, whilst the advancing classes of age present always differing relations. Such propositions, which partly contradict and neutralize one another, do not give us the desired information relative to the vitality of the total populations of these two cities, information which we justly expect from statistics.

At the last session of the International Statistical Institute I recommended a new method of calculation, which eliminates the influence of the various age classes by calculating the mortality within the several classes of age, but on the supposition that the age distribution in the localities to be compared was the same. Thus, the age distribution of A may serve as a basis (standard) for B, or *vice versa*; but we may even choose the distribution of a third locality, or the average distribution of the whole of Europe, as the standard distribution. This is the principal point in my proposal; the age classes to be chosen is a secondary consideration, and will be dealt with later on.

By a strange coincidence this same idea was brought before the session at the same time by Dr. Ogle, the eminent statistician of the English Registration Office. But on account of the novelty of the idea of a Standard Population, the Institute came to no decision, and resolved that a further report on the subject should be rendered at the next convention at Chicago. Only some time after the Vienna session it came

to my knowledge that Dr. Ogle had already perceived and applied the Standard Distribution in 1883,* and I am therefore bound and willing to acknowledge his priority, and will content myself with supporting his idea, and adding a few independent observations.†

3. *Calculation of Mortality Indices.*

I recommend that the death rate of the various age classes (the number of which will be discussed later on) be multiplied by the number of persons belonging to those age classes in the Standard Population, or, better still, by the figure representing the percentage of these age classes. This process produces new values, which I call Age Indices, in order to distinguish them from the Age Coefficient (death rate).

The age indices have this advantage over the coefficients, that they can be added. The sum of the age indices gives the general Mortality Index, which is uninfluenced by the varying distribution of age groups.

Let us assume that it was found desirable to distinguish the following 12 age classes, the percentage of which in the population selected as a standard (Sweden) was as follows:—

0 to 1 years, . . .	2.65 per cent.	10 to 20 years, . . .	19.54 per cent.
1 to 2 " . . .	2.49 "	20 to 30 " . . .	15.63 "
2 to 3 " . . .	2.49 "	30 to 40 " . . .	12.26 "
3 to 4 " . . .	2.32 "	40 to 50 " . . .	10.73 "
4 to 5 " . . .	2.35 "	50 to 60 " . . .	9.32 "
5 to 10 " . . .	10.62 "	Over 60 " . . .	9.60 "

Total of Standard Population, . . . 100.00 per cent.

Now to apply these ratios to Austria (1881) the following calculations would be necessary:—

1. Calculate the special death rate for each of the 12 age classes.

* Dr. Koch, the Director of the Statistical Office in Hamburg, informs me that as far back as 1883 he had also used the standard calculation, as can be seen on page 44 of the 12th part of the *Statistik des Hamburgischen Staates*. It gives us satisfaction to see that the reasons which our esteemed colleague adduced ten years ago for the necessity of a standard distribution agree almost word for word with ours.

† See also my first paper in the *Bulletin*, Vol. VI. chap. 2.

2. Apply these 12 death rates to the respective figures of the age classes of the standard population, which will produce 12 age indices.

3. By adding the age indices you obtain the general Mortality Index.

a. CALCULATION OF DEATH RATES FOR 12 AGE CLASSES.

Age.	Living on Dec. 31, 1880.	Died, 1881.	Death Rate. Per Cent.
0 to 1	679,458	208,357	306.7
1 to 2	588,521	52,635	89.4
2 to 3	561,479	27,640	49.2
3 to 4	542,773	18,267	33.7
4 to 5	542,599	14,466	26.7
0 to 5	2,914,830	321,365	110.3
5 to 10	2,421,696	30,664	12.7
10 to 20	4,277,867	25,901	6.1
20 to 30	3,588,816	32,610	9.1
30 to 40	2,969,307	34,772	11.7
40 to 50	2,450,404	41,336	16.9
50 to 60	1,838,486	52,381	28.5
Over 60	1,682,838	137,266	81.6
Unknown	.....	220	.....
Total,	22,144,244	676,515	30.6

b. CALCULATION OF MORTALITY INDEX BASED ON THE ASSUMED NORMAL DISTRIBUTION OF AGE CLASSES.

Age Class.	Death Rate.	Standard Distribution.	Died. Per Cent.
0 to 1	306.7	2.65	8.13
1 to 2	89.4	2.49	2.23
2 to 3	49.2	2.49	1.23
3 to 4	33.7	2.32	0.78
4 to 5	26.7	2.35	0.62
0 to 5	110.3	12.30	13.57
5 to 10	12.7	10.62	1.35
10 to 20	6.1	19.54	1.19
20 to 30	9.1	15.63	1.42
30 to 40	11.7	12.26	1.43
40 to 50	16.9	10.73	1.81
50 to 60	28.5	9.32	2.66
Over 60	81.6	9.60	7.83
Total,	30.6	100.00	31.26

It now only remains to answer the following two questions:

(1) How many age classes should be used, *i. e.*, how many death rates should be calculated?

(2) Which age distribution should be used as a standard?

4. *From what Number of Elements should the Mortality Index be Calculated?*

In my report addressed to the Vienna meeting I gave the results of my endeavors to arrive at the difference in the index caused in several countries by various limitations of the age groups. The first calculation was made for 12 groups, *viz.*, the first five years of life in five groups, 5 to 10 years in one group, and the higher age classes in six groups of 10 years each.

The following simplified methods were then tried:—

The first year was calculated separately, and 2 to 5 years taken as one group; the first five years were taken as one group; the ages from 5 to 20 years formed another group; and, finally, the higher age classes were arranged in five groups of 10 years each, and again in three groups of 20 years each.

From these calculations it was found to be preferable to group the first year separately, but there was no sensible change produced by placing the next 19 years (20 inclusive) in a single second group. In the ages over 20 years no difference in the mortality index was appreciable if for the numerous 10-year groups two larger groups, one comprising the ages from 20 to 50, and the other those over 50, were substituted. Regarding especially the more advanced classes (over 60 years) it was found that, in consequence of their drifting number, they may be unhesitatingly united with the class of 50–60. It is therefore evident that, as the results are almost identical if the above four groups are used, (*viz.*, 0–1, 1–20, 20–50, and above 50 years) instead of 12, the former quicker method should be preferred, especially

when monthly, or even weekly, calculations for several countries or towns have to be made.*

The admissibility of the different age limitations may be judged by the measure in which a change of age groups influences the succession. In the following 14 countries, it will be seen that, taking only four age death rates into consideration, the succession of these countries is almost identical with that resulting from 12 death rates, as shown in the table :—

	(a) 12 Death Rates.	(b) 4 Death Rates.
Sweden	1	1
Norway	2	2
Denmark	3	3
Scotland	4	4
Belgium	5	5
France	6	7
Netherlands	7	6
Switzerland	8	8
Prussia	9	9
Wurtemberg	10	10
Saxony	11	11
Bavaria	12	13
Italy	13	12
Austria (Cisleithania)	14	14

Thus the easiest calculation (that with four elements) did not cause more than two displacements, and even these of only one degree each.†

Dr. Ogle proposes an age distribution of 12 groups, subdivided according to sex, which would require 24 calculations. This increase of labor could only be justified if the result differed materially from that obtained by the simpler and quicker method. But such not being the case, and the

* The *International Weekly Bulletin*, edited by Dr. Janssens (Brussels), gives 250 towns. The usual calculation of one death rate for each town would require 250 calculations per week, and 6250 per annum. The introduction of a mortality index derived from four elements would quadruple the number of operations, and bring them to 25,000, whilst the introduction of 12 age classes would bring the number up to 75,000. Should Dr. Ogle's plan of separating the classes into two sex classes be adopted, the number of calculations required would rise to 150,000, which would hardly be feasible.

† In order to prove the sufficiency of the easiest method (with four elements), let us take the index of Sweden as 100; I will at the same time refer to the amendment proposed by Dr. Bertillon in the Committee of the Vienna Conference (*Bulletin*, Vol. VI, Part 1, page 38). He agreed to the index calculation in principle, and also accepted the above mentioned four age groups, but proposed that, on account of the greater mortality in the highest age classes, a fifth should be added for those over 60 years of age. This proposition ought to be respected, in case that the establishment of a fifth group influences the result; if

difference of the mortality of the two sexes being not great enough to compensate for the heavy increase of labor, I hope Dr. Ogle will qualify his recommendation, at least for cases in which it is essential to arrive quickly at a fairly reliable result.

5. *Use of the Standard Distribution for other Purposes.*

It must be mentioned that Dr. Ogle goes further than I in the application of the standard distribution, as he uses it not only for the calculation of the mortality index, but also for that of births and marriages.

Although these points are beyond the scope of my paper, which only pretends to deal with the death rate, yet in connection with the above I may be allowed to offer some brief remarks upon this topic. The distribution of ages is of im-

not, we ought to prefer the easier method. In order to show the working of this amendment, I give below a table from which will be seen the difference resulting from Dr. Bertillon's amendment. (See my paper in the *Bulletin*, page 305r, lib. C.)

MORTALITY INDEX OF 14 COUNTRIES, TAKING THAT OF SWEDEN AS 100.

	(a) 12 Death Rate.	(b) 4 Death Rate.	(c) Bertillon. (5 Death Rate.)	Difference Be- tween b and c.
Sweden	100 (1)	100 (1)	100 (1)	0.0 per cent.
Norway	108 (2)	108 (2)	108 (2)	0.0 "
Denmark.....	114 (3)	116 (3)	115 (3)	0.9 "
Scotland.....	115 (4)	116 (4)	115 (4)	0.9 "
Belgium.....	120 (5)	121 (5)	119 (5)	1.7 "
France.....	127 (6)	130 (6)	129 (7)	0.8 "
Netherlands.....	130 (7)	130 (7)	127 (6)	2.3 "
Switzerland	131 (8)	130 (8)	131 (8)	0.8 "
Prussia.....	144 (9)	144 (9)	143 (9)	0.7 "
Wurtemberg.....	151 (10)	153 (10)	151 (10)	1.3 "
Saxony.....	158 (11)	157 (11)	159 (13)	1.3 "
Bavaria.....	158 (12)	159 (13)	155 (11)	2.5 "
Italy.....	160 (13)	158 (12)	158 (12)	0.0 "
Austria.....	175 (14)	173 (14)	173 (14)	0.0 "

It will be seen that the 4-element calculation only differs from that of the 12-element by about 2 per cent, giving for a country whose mortality index is 30 per cent an index of between 29½ to 30½ per thousand, a difference which is without any importance, if it is the question to establish a quick and easy calculation of a fairly valuable measure of the mortality. It is also seen that the amendment of Dr. Bertillon causes a still weaker influence.

portance not only for the facts already quoted, but for nearly all phenomena of social life. The criminality of a country, for instance, depends also upon the number of those persons who, on account of their age, are able to commit crimes, and the much lamented larger rate of criminality of large cities is caused to a considerable extent by the simple fact that the age classes which contribute to it are more numerous there than in the villages. Similar difficulties present themselves in the statistics of professions, because here also the number of unemployed depends to a certain extent upon the number of infants and aged people. Therefore in almost all statistical calculations the age distribution has lately been taken into account. Thus, Bertillon (Senior) has proposed to calculate the births coefficient not from the total number of inhabitants, but from those at the age of puberty; in criminal statistics the coefficient of criminality is obtained from the number of people of the age classes which can be made accountable for crime, and some of them are even limited to the male or female portion of a population, as in military crimes or abortion.

But it is not possible to make a general rule as to the limitation of age classes in the various statistical problems. This will have to be considered for each case. So, for instance, in calculating the death rate, different age classes will have to be considered than in marriage or birth statistics. Dr. Ogle proposes for these the same standard distribution as for the mortality (0 to 5, to 10, to 15, etc.); but it appears clear that in calculating the marriage and birth rates the classes from 0 to 15 should be omitted, and for the birth rate, those also in the three classes from 65 years upwards. By omitting these six classes, Dr. Ogle's 12 classes will already be reduced to six, and a further reduction appears to me feasible.

6. Selection of the Standard Population.

It now remains to select the population whose age distribution shall be selected as a standard.

In my previous paper I have carried out calculations based on two standard distributions, that of Sweden and that of 14 European states, and it was found (see page 305r) that the order in which the mortality indices of the several countries succeed was almost identical in the two series of calculations. It appears advisable to adopt the simpler, *i. e.*, that based on the distribution in *one* country.* This, especially with only

* Dr. Bleicher, Director of the Communal Statistical Office, at Frankfurt a. m., has submitted a very searching critique of the standard and index calculation to the eighth conference of German Communal Statisticians, and, because the index changes as one or another age distribution is used as a standard, he came to the conclusion to adhere to the old death-rate calculation, at any rate not to abandon it altogether. The latter was never intended; no country can, for its own use, do without the mortality coefficient. But it is another question whether the death rate is suitable for international purposes. If it can be proved that the old coefficient furnishes a correct measure of international mortality, and that this measure is not altered by the different age distributions, there is, indeed, no reason for introducing a new method. But if we think that the death rate furnishes no reliable measure of the mortality,—and I venture to say that scientific literature occupies a hostile position towards this measure,—then it follows necessarily that a new method must be adopted, which is free from the faults pointed out. And this is the sole object of the proposition of Dr. Ogilvie and myself. As to the objection that the modification of the standard ages exercises too great an influence on the measure of mortality, that is a question of facts, which may be easily verified. I refer in this respect to my first paper, where the indices have been calculated on the base of two different standard populations. The one was taken from 4½ millions of inhabitants of Sweden, the other from the different average of 14 European countries with not less than 225 millions of inhabitants. Let us now see how in the two results the succession and the distance of the mortality indices changes. Assuming the mortality of the first country (Sweden) as 100, the others stand in the following order :—

	Standard : (a) 22½ Millions of the European States.	Standard : (b) 4½ Millions of Sweden.	Difference, Per Cent.
Sweden.....	100 (1)	100 (1)	0.0
Norway.....	108 (2)	108 (2)	0.0
Scotland.....	116 (3)	116 (3)	0.0
Denmark.....	117 (4)	116 (4)	0.9
Belgium....	121 (5)	121 (5)	0.0
France.....	131 (6)	130 (6)	0.8
Netherlands.....	131 (7)	130 (7)	0.8
Switzerland....	131 (8)	130 (8)	0.8
Prussia.....	145 (9)	144 (9)	0.7
Wurtemberg.....	155 (10)	153 (10)	1.3
Saxony.....	159 (11)	157 (11)	1.3
Italy.....	159 (12)	158 (12)	0.6
Bavaria.....	164 (13)	159 (13)	3.0
Austria.....	174 (14)	173 (14)	0.6

It will be seen (1) that, although the two standards are so vastly different, the order of the countries remained absolutely the same; (2) that the distance of the indices suffered

four age classes, could be calculated in a few minutes, whilst the other — as contained at the pages 305 *a-l* of my paper — represents the work of several days. Further, the census in the several European states is not taken simultaneously, and every statistician would therefore select a different country for his standard, and, unless one of the statistical offices is entrusted with the task of calculating and publishing the table of European standard, a uniformity of coefficients and indices will be impossible.

For these reasons, and on account of the eminent position occupied by Sweden relative to mortality statistics and census of population, I proposed to accept the age distribution of that country as the standard.

7. *Resolutions.*

As Dr. Ogle in his report has only given general indications of the new plan of calculation, without establishing any rules for its use, and as further he has not stated which age distribution should be accepted as the standard, I have to revert to the resolutions formulated in my first paper.

Although from Dr. Ogle's propositions it cannot be seen how far his harmonizes with mine,* yet this is possible by the actual calculations which are found in his other books. In the publications of the English Registration Office our esteemed colleague uses two standard calculations, one in the Annual Reports of that office, and the other in the Annual

only very slight variations; this distance changed in nine cases scarcely by 1 per cent, remained quite the same in three cases, and was altered only in one case by 3 per cent. The small variations shown above do not warrant the rejection of a theoretically more correct measure of mortality. In face of the approximative value of all measures of mortality there must be finally found a limit beyond which we could not persist in attributing any weight to claims against inaccuracy.

* *Bulletin*, Vol. VI, 1, pages 83 to 85, the proposal of Dr. Ogle is verbatim as follows: "I think it would be highly desirable to select, at any rate for purposes of international statistics, a standard population of fixed age and sex distribution, and to ask the officials in each country, who are charged with the statistics of mortality, to give each year in their reports the death rate for their country as it would have been had the population agreed in its composition with the international standard."

Summaries of Births, Deaths, and Causes of Deaths in London.*

The calculation used in the Annual Report corresponds entirely with that recommended by me. I therefore beg that my propositions should be considered only as amendments to a method which has been used by Dr. Ogle for some time previous to my proposals.

As regards the second method, however, I am sorry to say that I cannot agree with it, and since I have given my reasons more extensively (on pages 305, etc.) of my first paper, I will only here mention that Dr. Ogle's method brings us back again to the death rate, and any difference between the rough and the corrected death rate appearing in his calculations would not be the result of an intentional correction, but of an erroneous average calculation. If we eliminate this error, we are again before the rough death rate, which we intended to correct.

I therefore propose the following resolutions:—

Resolved: 1. In order to obtain a measure of mortality suitable for international purposes, *i. e.*, which will not be influenced by different age distributions in different countries, it is recommended to adopt Dr. Ogle's method, which reduces all age distributions to one standard distribution.

2. In order to obtain a rapid and yet sufficiently reliable result it is sufficient to calculate the death rates for the following four age classes, *viz.*, 0 to 1, 1 to 20, 20 to 50, and upwards of 50.

Recommended: 3. That the age distribution of only one country, for instance, that of Sweden, be adopted as a standard.

4. The new international mortality measure, here called the mortality index, be obtained by multiplying the death rates of the above four age classes by the figures representing the percentage of these age classes in the standard population. The result will be four age indices corresponding with the four age classes, which when added will give the Total Index, or, in other words, the international measure of mortality for the total population.

* The process under consideration is fully given in the Annual Summary for 1883 (quoted verbatim in my Report, on page 305 *y*). A full explanation of this method will also be found in Newsholme's *The Elements of Vital Statistics* (London, 1889).

5. The number of living is, in accordance with existing resolutions, to be calculated yearly on the basis of the difference between the numbers obtained at the two last censuses, and to be taken for the middle of each year. The standard distribution for the ten years elapsing between the general enumerations is to remain unaltered.

EXPERIMENTAL TABLE FOR AUSTRIA (CISLEITHANIA).

Age Group.	Standard Ages (Sweden, 1880).	Death Rate in Austria, 1881.	Mortality Index.
0 to 1	2.65 per cent.	30.67 per cent.	8.13 per cent.
1 to 20	39.81 "	1.90 "	7.56 "
20 to 50	38.62 "	1 20 "	4.63 "
Over 50	18.92 "	5.39 "	10.20 "
Total.	100.00 per cent.	.....	30.52 per cent.

CHARACTER AND VOLUME OF THE MONEY OF THE UNITED STATES.

BY MAURICE L. MUHLEMAN.

The accompanying statistics, relating to the monetary stock of the United States, its character, volume, and movement, are presented for the purpose of reviewing the movement since the silver legislation of 1878, and directing attention to certain facts, shown by the movement, bearing upon the currency question in general. Furthermore, the presentation in this form may afford additional material for the further prosecution of the inquiry into the operation of the law governing the demand and supply of currency (particularly with reference to the smaller denominations), which, at this time, is a subject of the first importance, bearing, as it does, upon the question how much silver can be absorbed into our circulation.

Omitting from consideration the minor coinage (of nickel and bronze), we have to deal with nine species of "money," of which three are metallic and six paper.

- I. Gold Coin (including bullion in the Treasury not yet coined).
- II. Silver Dollars, coined at the ratio of 15.988 (say 16) to 1 of gold.
- III. Subsidiary Silver Coin, coined at the ratio of $15\frac{1}{2}$ to 1 of gold.
- IV. Gold Certificates, issued upon specific deposits of gold coin.
- V. Silver certificates, issued upon specific deposits of silver dollars.
- VI. United States Notes, issued on the credit of the Government, but since 1879 always redeemable in gold coin on demand.
- VII. Currency Certificates, issued, in large denominations only, upon specific deposits of United States notes.
- VIII. Treasury Notes of 1890, issued on the credit of the Government to pay for monthly bullion purchases.
- IX. National Bank Notes, issued by banks upon deposits of bonds in the Treasury.

Of the above, Gold Coin, Silver Dollars, United States Notes and Treasury Notes of 1890, are legal tenders for any amount; Subsidiary Silver Coin to the extent of ten dollars. Gold Certificates and Silver Certificates are not legal tenders, but are receivable for all Government purposes. Currency Certificates and National Bank Notes are not legal tenders, but the latter are receivable for public dues, with the exception of duties on imports and interest on the public debt.

With the exception of National Bank Notes and Subsidiary Silver Coin, all of the kinds of money enumerated are available for the reserves of national banks.

The first table shows the amount belonging to the Treasury and that on deposit only for which certificates are in circulation; the second table shows the amount of each kind of money composing the entire stock; the third and fourth, composition of the money in circulation and that in the Treasury, respectively; the fifth gives the effective circulation, arrived at by deducting from the aggregate stock the amount deposited in the Treasury against which certificates are in circulation, and which is duplicated in the official reports of the entire stock; also the *per capita* of the entire circulation owned by the Treasury and effective circulation.

The four following tables show the denominations of several issues of paper money and proportion of small notes (from \$1 to \$20, inclusive), and the large.

The tenth table gives an approximate estimate of the "retail money," made up of the small notes, silver dollars, and subsidiary coin in circulation; the amount of the *per capita*, and the relation the amounts bear to the total effective circulation. Furthermore, there is given a tentative estimate of the gold coin in circulation.

The final table shows the bonded debt, the production and movement of gold and silver.

The movement in the monetary stock, as shown by the tables, was, for the period, as follows:—

End of Fiscal Year.	Entire Stock.	Metal.	Paper.	In Circu- tion.	In the Treasury.	Belonging to Treasury.	On Deposit Only.
1878	1,034*	301	763	807	257	164	93
1886	1,823	903	920	1,249	574	309	265
1893	2,317	1,207	1,110	1,594	723	139	584

It appears, therefore, that the aggregate stock increased more than 117 per cent, while the population, estimated at 48 millions in 1878, and at 67 millions in 1893, shows an increase of only $37\frac{1}{2}$ per cent. The amount in circulation, however, increased something less than 100 per cent; and if we consider only the effective stock, which in 1878 was $(807 + 164)$ 971 millions, and in 1893 $(1594 + 139)$, 1733 millions, the proportion of increase was only about 68 per cent. The money in the Treasury, and belonging to it, being used in its daily transactions, is here properly included as effective circulation.

Examination of the character of the increase shows that it has been chiefly in gold and silver and the representative paper issues (including the Treasury notes issued for bullion), the only decrease having been in the national bank notes.

The gold stock appears to have increased 379 millions, of which 319 millions is in the amount supposed to be in circulation. This estimate of the gold stock has been questioned by many writers, and by the more conservative is believed to be fully 100 millions less than represented by the official statistics. If, then, the effective circulation be reduced by reducing the gold coin estimated as in circulation, it seems probable that the effective circulation is not much above 1600 millions, which would indicate an increase of about 65 per cent since 1878.

The amount *per capita* for 1878 appears to have been about \$20.23 of effective circulation, and for 1893 about \$25.86; the amount in actual circulation appears to have been \$16.81 in 1878, and \$23.79 in 1893, after making the deduction in

* The figures represent millions of dollars.

gold coin the net circulation was \$16.25 and \$22.12, and the net effective stock \$19.67 and \$24.19, respectively. In the table exhibiting this feature a tendency to a *per capita* of about \$21 seems to impress itself on the observer. The years from 1886 to 1888, during which the surplus in the Treasury rose to very high figures, curtailing somewhat the circulation performing the active work, show the deviation to a lower, followed by a higher, ratio; it was during the beginning of this period that the silver stock of the Treasury (and therefore of the country) appears to have been relatively redundant. But the issue of small silver notes authorized in 1886, and coming into use the following years, relieved the situation of the threatened peril of such a surplus.

Turning now to the tables showing the denominations of the paper issues we find the following changes: — *

End of Fiscal						Total	50's and	Total	
Year.	1's and 2's.	5's.	10's.	20's.	Small.	100's.	Large.	Large.	
1878	49	149	169	130	497	110	156	266	
1886	36	169	218	185	608	140	173	313	
1893	71	244	299	230	844	119	147	266	

It is evident that in 1886 the supply of small notes was not only relatively (to the large) but also absolutely insufficient; and here is where the demand for the further issue of 1's, 2's, and 5's (finally granted after a vain attempt to force into circulation the silver dollars) made itself felt. Even now (before the abnormal stringency of July and August of the present year) the demand for the four minor denominations is not satisfied, and certainly 50 millions, possibly much more, could be added to the present stock of these denominations.

From the tables it is evident that fully 75 per cent of the paper circulation has been, in normal years, in these smaller denominations; and that 85 per cent, constituting nearly 60 per cent of the total effective money, might be in such notes. This, it will be observed, is entirely without considering the gold coin (which is all in small denominations), or the silver actually outside of the Treasury.

* The figures represent millions of dollars.

In the following table the "retail money," composed of the small notes, plus the silver dollars and subsidiary coins in circulation, is shown. These forms of money have increased as follows:—*

Fiscal Year.	Gold Certificates.	Silver Certificates.	U. S. Notes.	Treasury Notes.	National Bank		Silver Dollars.	Subsidiary Coin.	Total.
					Notes.	Dollars.			
1878	..	...	224	...	273	1	65	563	
1886	12	95	243	...	253	53	46	707	
1893	9	296	261	127	151	57	65	966	

The amount of retail money *per capita* was, in 1878, \$11.74; in 1886, \$12.40; and, in 1893, \$14.42.

The amounts of the large denominations, which may, for convenience in distinguishing, be termed "wholesale" or "banking" money, were composed, as will be observed by reference to the tables, chiefly of Gold Certificates and United States Notes, and the Certificates issued upon deposits of the latter; Silver Certificates and National Bank Notes have long ago ceased to play an important part in the larger transactions.

The experience of 1886, and the satisfactory remedy then applied, would appear to indicate a means by which the silver stock (now feared by so many as a destructive element), constituting as it does, directly and indirectly, about one-third of our effective circulation, could be readily absorbed, provided its acquisition be suspended, as appears probable will be done before long. In other words, our "retail money" could with perfect safety be composed of silver paper issues; the only remaining elements of the problem being (1) to arrive at a satisfactory figure of the *per capita* requirements of the country; (2) to provide for the ready absorption of the surplus of such notes, which regularly presents itself, particularly in the city of New York, when the active business operations, resulting from the periodical crop movements, have been performed.

From January to June of each year the steady current of small notes from the West to the East, interrupted for only a

* The figures represent millions of dollars.

very short period in March, threatens to swamp the capacity of the banks in that city and of the Treasury to absorb; useless for the time being in the West, they become a positive burden in the East, until again needed for the crop movement, beginning usually about August 1st.

If the persistent recurrence in years of normal business of the amount of \$21 *per capita* indicates the currency need, and if the retail requirement represents more than half of the circulation, have we not perhaps a key to the determination of the questions of volume? and with that of the absorption of our silver stock?

If in the past few years the supply of money has been redundant, as may be reasonably inferred from our losses of gold, is it not, nevertheless, probable that if we had had only the allotted amount, our silver would not have caused the gold loss? In other words, if we had had only the proportion of silver called for by our normal needs, would a loss of gold have been properly attributable to silver?

It would then remain only to provide a convenient and satisfactory form of "bank money" into which the "retail money" could be converted to provide for the annual ebb and flow of small notes.

It is to be hoped that wise legislation may ere long bring about greater homogeneity, as well as security, in our currency system.

The accompanying tables, abstracted from the others, illustrate the principal points.

I. TABLE SHOWING THE ENTIRE STOCK, ITS COMPOSITION AND DISTRIBUTION.

Fiscal Year Ending June 30.	The Entire Stock.										In the Treasury.			Deduct for Over- Estimate of Gold.	Net in Circulation.	Net Effective Circulation.	Per Capita.	
	Gold Coin and Silver Dollars and Bullion.	Subsidiary Silver Coin.	Gold Certificates.	Silver Certificates.	United States Notes.	Treasury Notes of 1890.	National Bank Notes.	Currency Certificates.	Total.	On Deposit Only.	(Held by Treasury.	In Circulation.						
1878	213	16	44	2	347	....	325	47	1,064	93	164	807	27	780	944	\$16.25	\$19.67
1879	246	41	76	15	3	347	....	329	31	1,088	49	824	35	789	1,004	16.10	20.49
1880	352	69	79	8	12	347	....	344	14	1,225	35	978	43	935	1,147	18.70	22.94
1881	478	95	80	6	51	347	....	354	12	1,423	60	1,119	52	1,067	1,302	20.92	25.53
1882	507	122	80	5	67	347	....	357	13	1,498	85	1,178	63	1,115	1,356	21.44	25.96
1883	543	152	81	82	89	347	....	356	13	1,683	184	1,236	76	1,100	1,402	21.48	25.96
1884	545	179	75	98	121	347	....	339	12	1,716	231	1,242	82	1,160	1,403	21.09	25.51
1885	580	208	75	140	140	347	....	317	29	1,845	310	1,240	89	1,201	1,446	21.44	25.82
1886	591	237	75	131	116	347	....	308	18	1,823	265	1,249	91	1,158	1,467	20.32	25.74
1887	635	278	75	121	146	347	....	279	9	1,910	276	1,317	96	1,221	1,538	20.70	26.07
1888	706	310	76	142	229	347	....	252	15	2,077	386	1,372	100	1,272	1,591	20.20	26.52
1889	680	344	76	154	263	347	....	211	17	2,092	434	1,380	104	1,276	1,554	20.91	25.47
1890	695	380	77	157	302	347	....	186	12	2,156	471	1,429	107	1,322	1,578	20.90	25.05
1891	647	437	78	152	314	347	50	167	24	2,216	540	1,499	109	1,390	1,567	21.72	24.49	
1892	664	491	77	157	332	347	101	172	30	2,371	620	1,603	109	1,494	1,642	22.64	24.88	
1893	592	538	77	94	331	347	147	179	12	2,317	584	1,594	112	1,482	1,621	22.12	24.19	

NOTE.—Amounts are always given in the nearest millions of dollars.

II. TABLE SHOWING "RETAIL MONEY," ITS COMPOSITION AND AMOUNT PER CAPITA.

Fiscal Year Ending June 30.	Large Denominations of Paper.				Composition of Small Denominations.						Total Small Denominations.	Per Capita of Small.	Silver Dollars in Circulation.	Subsidiary Silver in Circulation.	Total Silver Coin.	Per Capita of Silver.	Total Retail Money.	Per Capita.
	Small Denominations of Paper.				Denominations.													
	1's and 2's.	5's.	10's.	20's.	Certificates.	Silver Certificates.	United States Notes.	Treasury Notes of 1890.	National Bank Notes.									
1878	266	49	149	131	...	...	224	...	273	497	\$10.36	1	65	66	\$1.38	563	\$11.74	
1879	230	43	150	171	...	...	215	...	280	495	10.10	8	67	75	1.53	570	11.63	
1880	175	45	166	191	...	4	263	...	293	550	11.00	19	55	74	1.48	624	12.48	
1881	167	48	169	216	...	...	38	264	...	301	603	11.82	29	53	82	1.61	685	13.43
1882	173	52	165	223	...	...	54	259	...	303	616	11.84	32	52	84	1.62	700	13.46
1883	248	54	165	230	...	9	72	260	...	298	639	11.83	35	52	87	1.61	726	13.44
1884	272	62	163	230	200	13	96	254	...	282	645	11.73	40	46	86	1.56	731	13.29
1885	349	51	157	221	195	12	104	248	...	262	624	11.14	38	44	82	1.46	706	12.60
1886	313	36	169	218	185	12	95	243	...	258	608	10.66	53	46	99	1.74	707	12.40
1887	263	41	181	226	191	11	135	257	...	236	640	10.85	55	49	104	1.76	744	12.61
1888	275	55	205	248	201	13	221	262	...	214	710	11.83	56	50	106	1.77	816	13.60
1889	301	55	203	242	191	11	256	245	...	179	691	11.33	54	51	105	1.72	796	13.05
1890	276	60	212	261	196	12	253	263	...	157	728	11.56	66	54	110	1.75	838	13.30
1891	290	61	225	272	206	14	297	274	37	142	764	11.94	68	58	116	1.81	880	13.75
1892	326	65	237	288	222	12	302	274	70	146	813	12.32	57	62	119	1.80	932	14.12
1893	266	71	244	250	230	9	296	261	127	151	844	12.00	57	65	122	1.82	966	14.42

NOTE.—Amounts are always given in the nearest millions of dollars.

FLUCTUATIONS IN THE SECURED CIRCULATION
OF THE NATIONAL BANKS AND THEIR RE-
LATIONS TO THE PRICES AND INVEST-
MENT VALUES OF BONDS.

BY CHARLES A. CONANT.

Against the national banking system there has always been the complaint of the opponents of the system that the banks were able to draw "double interest," because they received the interest on their bonds while making a profit by the loan of the currency based upon the bonds.

The criticism was strongest, perhaps, at the very moment when the banks began to find circulation unprofitable. The familiar rule of all financial speculations, that valuable securities become less profitable than more hazardous ones because of the high premium at which they sell, operated in the case of the United States bonds. The resumption of specie payments, the adherence to the policy of paying interest in gold, and the undoubted credit of the government, made "the bond-holder" an envied individual, but it also made the holding of the bonds as a permanent investment less profitable than the sale of them while the price was high.

Every year that brought the bond nearer to maturity lessened the selling price, and made it more desirable, up to a certain time, for the alert financier to dispose of his property at a premium rather than hold it drawing a moderate rate of interest until he should be obliged to accept its bare face value on the date of its maturity. It became a simple mathematical proposition for the national banks whether it were more profitable to market the bonds and lose the small profit on circulation or to retain them and lose the benefit of their high prices. The question was substantially the same, as a mere abstract question of mathematics, whether a bank

already owned the bonds or whether a new corporation went into the market to buy them. What the new bank was obliged to pay the old bank was losing by failing to sell. How futile even the charm of "double interest" proved against the temptation of better-paying investments, and how the national bank-note circulation changed with changed conditions, I have endeavored to show at a glance in the following summary table of the state of the banks and the bond market for a series of years:—

Date.	Authorized Capital Stock.	Circulation Secured by Bonds.	4 Per Cent Bonds. Price.	Investment Value.
1882. January.	\$470,018,135	\$332,398,922	117.75	3.008
July.	486,511,335	320,312,832	119.12	2.922
1883. January.	492,076,635	322,386,120	119.62	2.901
July.	507,208,135	319,249,896	119.12	2.926
1884. January.	518,031,135	310,953,321	123.75	2.665
July.	528,784,165	299,369,370	118.75	2.918
1885. January.	529,910,165	285,496,055	121.90	2.726
July.	531,540,465	279,528,175	122.64	2.668
1886. January.	534,378,265	274,466,748	123.43	2.607
July.	545,206,565	247,087,961	126.49	2.420
1887. January.	555,865,165	205,316,106	127.83	2.320
July.	574,703,665	171,629,341	127.84	2.284
1888. January.	584,726,915	165,205,724	126.12	2.341
July.	592,852,915	159,642,657	127.48	2.230
1889. January.	598,239,065	146,372,588	127.29	2.208
July.	609,670,365	132,244,437	128.38	2.109
1890. January.	623,791,365	127,742,440	125.61	2.236
July.	646,937,865	129,767,150	122.32	2.407
1891. January.	665,247,865	125,660,361	120.92	2.463
July.	676,247,865	127,221,391	117.33	2.676
1892. January.	685,762,265	140,084,203	116.67	2.693
July.	692,123,665	145,683,023	116.45	2.677
1893. January.	.....	150,526,651	114.00	2.864
July.	.....	157,901,099	109.75	3.179

The essential feature of the table is that the secured circulation of the national banks has until the last two years been steadily diminishing as the investment value of the bonds declined. The national banking act requires a minimum deposit proportioned to the capital stock of the institu-

tion, so that no bank, without going out of business, could dispose of its entire holdings of bonds; yet so general was the movement to retire circulation which had become unprofitable and dispose of the bonds that the reports to the Comptroller of the Currency for October 2, 1890, showed that out of a total sum of \$139,969,050 in bond deposits \$101,247,615 was required by law, and only \$38,721,435 was voluntarily on deposit to obtain the benefit of additional circulation.

The maximum secured circulation of the national banks of the country, after the redemption of specie payments, was reached in January, 1882, and the amount showed no tendency to increase for nine years after that date. The fall was slow until the beginning of 1884, in which year it averaged about \$2,000,000 per month. The process of reduction was somewhat arrested during the next year, only to advance at a greatly quickened pace in 1886. The decline of circulation secured by bonds was from \$274,466,748 on January 1, 1886, to \$205,316,106 on January 1, 1887, an average decline of nearly \$6,000,000 per month. The volume of outstanding circulation secured by bonds was now so reduced that the aggregate decline year by year was smaller, but the rate of decline continued nearly as great as before until the year 1890, when a comparatively stationary point was reached.

The striking fact about the decrease in secured circulation down to 1891 is that it has not been accompanied by any decrease in the number of national banks or in their aggregate capital stock. The organization of new institutions for the purpose of banking, exclusive of large issues of circulation notes, has gone steadily on while the older banks have been retiring their circulation. Not since 1879 has there been any decrease in the number of national banks. The net increase in the number of banks in the year ending October 31, 1880, was 45, and in 1883 the number was 220. This number was not reached again until 1890, when the net

increase was 248. It has been less for the three years which have followed, but the number of banks on October 31, 1892, was 3,738, and the aggregate capital was \$693,868,665.

The sensitiveness of the banking interest to changed conditions, and the element of elasticity which bank-note circulation is capable of adding to the currency have been most strikingly shown within the past year. There was some increase in the circulation, based upon bonds during the two years since August, 1891, but this increase was only \$9,000,000 during the last five months of 1891, and only \$12,000,000 more during the next year, to January, 1893. The increase during the first half of the present year, also, was only \$7,374,448, but July and August have shown a wonderful expansion. The increase in circulation secured by bonds was \$5,320,194 during July, and has already been \$6,784,835 during the first fifteen days of August. The latter figure is that of the notes actually issued. The bonds deposited to obtain new circulation have reached the amount of \$14,452,550, and the orders for new bank notes, for which bonds will be deposited when the notes are printed, if they have not already been, reach the almost unprecedented amount of \$25,511,450 for fifteen days.

The turning point in the aggregate circulation did not come as quickly as in the circulation based upon bonds, because of the reduction going on in the dead circulation which was in process of retirement while the live circulation secured by bonds was on the increase. The cancellations having come nearly to a standstill, the increased issue of live circulation shows in the totals, and these figures have advanced from \$178,614,535 on July 1st to \$183,655,920 on August 1st, and \$190,193,462 on August 15th.

The rate of interest realized by investors on the four per cent bonds was at its lowest point in the quarter beginning with April, 1889. It was soon after this that the circulation secured by bonds reached nearly its lowest point, and became stationary. The value of bonds as an investment had been

falling since the beginning of 1885, when the process of retirement was attaining momentum. The value began to rise again towards the close of 1889, and reached a figure in the middle of 1890 which practically ended the retirement of bank-note circulation. The premium dropped from nearly 121 to 116.75 during 1891, and the circulation secured by bonds advanced from \$125,660,361 at the beginning of the year to \$140,084,203 at the beginning of the next year.

Such a sensitiveness to a slight change in the investment value of a bond shows upon what narrow margins the banking transactions of today depend. The "double interest" which was supposed by the demagogues to be piling up such fabulous fortunes for the bankers proved an insufficient attraction to keep their circulation afloat when the bonds fell off a fraction of a cent in paying value. It was only when the demand for currency began to grow that the issue of bank-note circulation again became profitable, and led to the large increase of the past few months. There is an opportunity to make the banking system more responsive to the occasional demands for currency by increasing the proportion which the notes issued bear to the face value of the bonds. This was fixed at ninety per cent in the original act, with a just regard to the discount on bonds, but there is perfect security today in fixing it at one hundred per cent, and affording the banks an opportunity to increase their present volume of circulation by about eleven per cent. It would add but a minute fraction to their profits, but that fraction might turn the scale in favor of increased circulation when the country was most in need of it.

This change of the law has been recommended by at least four successive comptrollers of the currency, and has several times been favorably reported upon by committees of Congress. It is now embodied in a bill under discussion in the Senate, and which seems likely to become a law. The question of thus increasing our monetary circulation through the national banking system becomes of greater importance than

heretofore, if the means of expanding the circulation which exist in the silver act of February 28, 1878, and the later act of July 14, 1890, are brought to an end. The repeal of the Sherman law will leave only two available avenues of increasing the circulation to keep pace with the growing population and volume of business in the country. Those means are the importation of gold, which can be converted into gold certificates upon presentation at the Treasury, and the increase of national bank-note circulation. The latter device may not be adequate for a prolonged future, but it is likely to afford an element of growth in the volume of the circulating medium sufficient to enable Congress to deliberate, for two or three years if need be, upon the substitution of a simple and sound currency system for our present complicated and uncertain conglomeration of gold coin, silver coin, gold certificates, silver certificates, United States notes, Treasury notes, and national bank notes.

Synopsis.]

CURRENCY REFORM IN AUSTRIA-HUNGARY.

BY DR. JULIUS MANDELLO,

BUDAPEST UNIVERSITY AND MINISTRY OF FINANCE, HUNGARY.

The currency reform in Austria-Hungary is one of the most interesting problems with regard to the monetary system, because in all currency reforms which are described in the monetary history of our century there is no one to which the currency reform of Austria-Hungary can be compared.

It is very important to note in the first place that currency reform in Austria-Hungary includes two widely different steps of financial evolution. The country has some hundred millions of florins of paper money, state notes, not covered by any metal, and being by law a legal tender. The first part of the currency reform consists in the abolition of this paper money, and in beginning and continuing to pay cash, or metal money, for the state's notes. As a second part of the currency reform, but very closely connected with the first part, is a change of the currency system.

This currency reform is not only very interesting to the political economist and to the man of jurisprudence, on account of the important economical changes which will follow this reform, and on account of the complicated judicial questions which are connected with the problem, but there is also a great field of work for the statistician. The history of money in Austria-Hungary cannot be understood without very complicated statistical tables, and it is quite a new problem to point out the relation between the value of the Austrian-Hungarian currency (so-called) and the price of silver since the year 1879, at which time the coining for private persons in the mints was stopped. The statistical problem consists in the establishing of the supposed purchasing power of the Austrian-Hungarian currency in different times, a problem which needs a large collection of statistics

of prices. I hope to be able to submit to the International Statistical Institute tables built up partly from private material and partly from material collected by the two ministers of finance in Austria and in Hungary, and I believe that it is not necessary to say a great deal about these tables, as I have always believed that statistical tables speak much more strongly to a scientific statistician than many printed pages. The only thing I presume to be necessary for understanding this collection of statistical material is to have a clear idea of the character of the Austrian-Hungarian monetary system as it has been established until recently and of the new feature which is to be established by the currency reform.

The history of the currency in Austria-Hungary is a history of disease, but it is only the last phases of this disease which interest us, and which began twenty-five years ago. Austria adopted at that time the pure silver currency system. It was provided by law that for every pound of pure silver there ought to be coined forty-five florins, and this relation of measure is the basis of the monetary system. For different political and economical reasons the treasury was obliged to issue paper state money without any metal basis, and which was declared to be a legal tender. At the same time it was necessary to change in part the character of the bank notes. Austria-Hungary has only one bank (called the "Austrian-Hungarian" Bank, or formerly the "National Bank") having the privilege to issue notes. This bank lent a good deal of its credit to the state, so that at the time when the state itself issued 312,000,000 florins of state notes it would have been a case of impossibility for the bank to pay silver for the bank notes presented to it. It was therefore provided by law that as long as the state notes were enforced the bank ought not to be obliged to pay back silver for the notes presented to the bank officers, but that silver and state notes could be ultimately used. Resuming this monetary situation, it was a pure paper currency system grown up on a silver basis.

During the period from 1867 to 1878 the Austrian-Hungarian money had always an agio against the silver money, but at the same time the price of silver in the whole world declined, and the difference between the value of a silver florin and a paper one became always less. Ultimately, there was no difference at all, but only for a short time. At this time (1879) the two governments decided that the free coinage of silver ought to be stopped in the mints for private persons, as the constantly declining price of silver gave an excellent chance to these people to make large profits at the expense of the community. In this way did it happen that the free coinage of silver was stopped in 1879, and there was only a limited amount of coinage by the two governments.

Now begins the very interesting problem of the evolution of the value of the Austrian-Hungarian currency quite or nearly independent from the value of silver quoted at the market. Really, the paper florin, and with them the few silver florins that had been in circulation, now became a disagio. In regard to the silver question, Austria-Hungary was in the same situation as is now to be found in the United States, *i. e.*, the circulating paper and silver money had a higher value than the silver for which it circulated or which is contained in it. These different features had, from an economical point of view, borne an influence on the common events in Austria-Hungary. There were to be feared two things: First, that the value of money would constantly increase; and, second, that there would be rapid changes in the value of currency.

These changes having their constant expression in the quotations of the foreign markets, the statistical table of the Austro-Hungarian exchanges quoted in gold countries, or the quotations of gold exchange at the stock exchange of Vienna and Budapest, show perfectly this constant fluctuation in the value of the Austro-Hungarian money. On account of this fluctuation there is, in the first place, a speculative tendency to the whole business, and, in the second

place, a dependence of the countries with which Austria-Hungary has a strong commercial connection, these being all gold-standard countries. Austria-Hungary also being a state with many international debts, contracted in great part in gold, the state itself was constantly obliged to speculate in regard to paying the interest of its bonds. As, on the other hand, the whole economic situation of the two countries was very prosperous for the last twenty years, it was decided to change the state of the monetary system. It was decided to pay off the state paper money, and to issue for this purpose bonds. In the second place, silver not showing more of a constancy of value needed for a standard, international bimetalism, even if theoretically acceptable, being impossible at present for political reasons, Austria-Hungary decided to accept the monometalism and the gold standard, joining in this way its western neighbors and commercial connections. In the tables to be submitted it will be necessary to give a *résumé* upon subjects entitled as follows:—

Monetary statistics at the year 1892.

Description of the different laws establishing the new currency.

Description of the question to be solved concerning the relation between the new gold standard and the old paper standard.

Criticisms of the statistical work done in regard to pointing out the average quotation of this relation.

Description of the state of transition.

Actual results and statistical data down to the present state.

COMPARATIVE STATISTICS OF PRIMARY EDUCATION.

BY E. LEVASSEUR,

ON BEHALF OF THE COMMITTEE OF STATISTICS OF PRIMARY EDUCATION.

In 1889 the International Statistical Institute, in its session at Paris, appointed a committee to study the methods and results of primary education.

The reporter, M. E. Levasseur, presented to the session at Vienna, in 1891, a report composed of two parts: (1) Ten chapters devoted to the study of primary education in England, Scotland, and Ireland; in Holland, France, German Empire (Prussia, Saxony, Bavaria, Baden), Switzerland, Austria, and Hungary, Sweden, and Norway; (2) Comparative statements upon the pedagogical organization, statistical methods and situation of education in the above-named states.

M. Levasseur presents today on behalf of the same committee a second report, composed on the same plan, in which the following states are described: Spain, Portugal, Roumania, Finland, United States, and the Argentine Republic.

The data upon which this report is based have been prepared and sent to M. Levasseur by the directors themselves of the statistical service, who are nearly all members of the International Statistical Institute. That *résumé*, as regards the European states, is limited to the most characteristic facts.

SPAIN.

	1846.	1885.
Number of public schools.....	12,337	24,529
“ “ private “	3,283	5,576
“ in 1880, of teachers in public schools.....	23,783	.....
“ “ “ “ private “	9,751	.....
“ of pupils in public schools.....	549,607	1,552,434
“ “ “ “ private “	114,004	290,749
Expenses for public primary education.....	29,149,974 pesetas.	.....

PORTUGAL.

	1885-86.	1888-89.
Number of schools.....	5,384	5,339
(Of which are official schools).....	(3,657)	(3,825)
Number of teachers.....	3,776	4,069
" " pupils.....	236,936	237,783
In 1883, expenses for public primary education.....	564,667 rubr6is.	.....

ROUMANIA.

	1872-73.	1891-92.
Number of primary schools.....	2,401	3,994
" " teachers in the public schools.....	2,480	3,938 ¹
" " pupils.....	92,023	238,681

¹ The number of teachers in private schools was 855 in 1872-73; it is not given for 1891-92.

FINLAND. PUBLIC SCHOOLS ONLY.

	1873.	1891.
Number of schools.....	408	1,134
" " teachers.....	408	1,385
" " pupils.....	18,234	51,000
Expenses.....	.....	2,815,000 marks ¹

¹ All the expenses are not included in this total.

Taking into consideration the great importance of the American people, and the educational system in the United States, the chapter on the United States is much more developed. The numerical data have been taken mostly from the *Annual Report of the Commissioner of Education*. It includes briefly the history of primary education from the act of Massachusetts in 1642 to the present time, and indicates why the establishment of the free-school system and the general improvement and propagation of primary education are the one essential condition of American democracy.

Then the reporter investigated (1) The administrative organization of education in some states, particularly in Massachusetts, Rhode Island, and Illinois; (2) The courses of studies and number of hours attributed to each course, accord-

ing to the chart exhibit in the World's Columbian Exposition, by W. T. Harris; and, (3) The works of those collectors of public statistics, which are condensed in the most important *Annual Report of the Commissioner of Education*.

That part of the chapter devoted to the results of the statistical work states for each state or territory, for several years, the number of schools, teachers, pupils, etc., and for the United States the general yearly results since 1870. It would be sufficient to give in the present outline a summary of the accomplished progress, and extract some statistics relating to three years, 1870, 1880, and 1890.

Common Schools.	1870.	1880.	1890.
Number of school houses.....	116,312	178,222	226,839
Value of school property.....	\$130,383,008	\$209,571,718	\$342,876,494
Number of teachers, male.....	77,520	122,795	125,002
“ “ “ female.....	129,932	163,798	283,333
“ “ “ total.....	230,225	286,593	563,935
Expenses for salaries.....	\$37,832,506	\$55,942,972	\$91,683,338
Total expenditure.....	\$63,396,066	\$78,094,087	\$140,277,484
Number of enrolled pupils.....	6,871,523	9,867,505	12,697,196
Average attendance.....	4,077.347	6,145.932	8,144.938
Attendance per 100 enrolled.....	59.3	62.3	64.1
Average number of days of class in school..	132.2	130.3	134.3
Number of pupils in private schools.....	.....	.....	1,611,200

In the United States, according to their population, the proportion of enrolled pupils is very high, 22 per 100 out of the total population are enrolled in public or private schools. Nevertheless, because the number of the class days is limited (134), and the attendance, while greater than formerly, is only 64 per 100 in 1890, the result is that every pupil is, by average, attending school only $87\frac{1}{2}$ days. The proportion is much better in towns (190 class days, and 70 attending out of every 100 enrolled) than in the country (115 class days, and 62 attending).

In the second part of his report, M. Levasseur says that, as in most other matters of facts, so in educational statistics, an international comparison is very difficult to establish, and

that this kind of comparison cannot be absolutely correct. The institutions are not the same everywhere, and the same names (or about the same by translation) do not cover the same things; so the common schools in America are not exactly corresponding to *écoles primaires publiques* in France, and much less to "inspected schools" in England. The enrollment of pupils and the statement of attendance are not established upon the same system; the name *la chef* or *maître* does not signify the same degree of science or the same professional attainments in all countries.

Of course, the reporter concludes that the international statistics of primary education is an interesting subject of inquiry, very useful, but practical only for pedagogues who know sufficiently the diversity of institutions; and that the results must be used only with caution. If one extract statistics from two statistical volumes published by two different states, and compare them without stating beforehand that they are really of the same species, he would be exposed to gross mistakes and false judgments.

As the International Statistical Institute intends principally to propose uniform rules in matters of public statistics and promote the statistical publications, the reporter ends his report enumerating the necessary data for the statistics of primary education, and inviting every civilized state to publish, at least once in five years, an official record of statistics on this matter. That is a minimum requested by M. Levasseur; but many states have not yet given it. The United States give much more; so, instead of looking to others as a model, they may be rather cited as an example.

Two comparative tables, extracted from the second part of the report, are as follows:—

Year.	States.	Public Schools.	Private Schools.	Total.
1890	England and Wales	19,498	.....	.....
1890	Scotland	3,076	.....	.....
1889	Ireland	8,251	.....	.....
1889	Holland	2,952	1,263	4,215
1890	Belgium	5,673	.....	.....
1890	France	67,359	14,498	81,857
1886	Prussia	34,016	1,209	35,225
1889	Saxony	2,205	77	2,282
1890	Baden	1,580	30	1,610
1890	Bavaria	7,141	57	7,198
1890	Austria	17,619	979	18,098
1880	Hungary	17,619	979	16,702
1889	Italy	44,664	7,975	52,639
1889	Sweden	10,516	.....	.....
1888	Norway	6,282	.....	.....
1885	Spain	24,529	5,576	30,105
1889	Portugal .....	.....	.....	5,339
1892	Roumania .....	.....	.....	3,994
1891	Finland .....	.....	.....	1,891
1890	United States	224,839	.....	.....

Year.	States.	Number of Pupils.	Observations.
1890	England and Wales	4,341,364	Only inspected schools.
1890	Scotland	664,466	Only inspected schools.
1889	Ireland	507,865	Only inspected schools.
1889	Holland	652,978	.....
1890	Belgium	616,091	Only public schools.
1890	France	5,601,567	.....
1886	Prussia	5,082,252	.....
1889	Saxony	583,242	.....
1890	Bavaria	831,829	.....
1890	Switzerland	476,101	Only public schools.
1890	Austria	2,872,929	.....
1889	Hungary	2,015,612	.....
1889	Italy	2,241,220	.....
1889	Sweden	668,112	.....
1888	Norway	295,239	Public schools only.
1885	Spain	1,843,183	.....
1889	Portugal	237,783	.....
1892	Roumania	238,681	.....
1891	Finland	51,000	Public schools only.
1890	United States	12,697,196	.....

The conclusions are the same as those of the previous report. The Committee recommended to every state to publish a statistical report on education at least every fifth year,

and to define exactly in this report the meaning of the words school, class, teacher, pupil; to include in those statistics (1) *Appropriations for the public schools* (from state and other sources); (2) *Number of primary schools* (public and, if it is possible, private); (3) *Number of teachers; number of pupils*; (4) *Number of enrolled scholars who can read*, for the countries in which this information exists. These statistics are to be regulated according to the definitions adopted at the Vienna session.

RESULTS OF RECENT INVESTIGATIONS ON PRICES IN THE UNITED STATES.

BY PROF. F. W. TAUSSIG,
HARVARD UNIVERSITY.

In 1891 the Finance Committee of the United States Senate was instructed to gather information as to the course of prices and wages in the United States, the object in view being to secure authentic facts bearing on the effects of tariff legislation. In 1892 the first report of the Committee was presented, giving the results of an investigation as to retail prices immediately before and immediately after the passage of the Tariff Act of 1890. The second report of the Committee, issued during the present year, treats of the course of wholesale prices, of wages, and transportation rates, for the half century from 1840 to 1891. It is with the results of this second investigation that the present paper is concerned.

Virtually, both these reports may be regarded as publications of the Department of Labor. The Senate Committee wisely put the task of collecting the desired facts and figures in the charge of that Department, and the skill and judgment of Commissioner Wright have yielded results whose importance and interest to the economist can hardly be overstated. Not only that, but the task of analyzing, digesting, and presenting the salient results was put into the trained hands of Prof. R. P. Falkner, whose introductory synopsis cannot be too highly praised. The whole report fills four large volumes; of these the first contains Prof. Falkner's synopsis. Here economists will find much the greater part of the results on the movement of prices presented in so clear and so skillful a manner as to dispense largely with the need of consulting the detailed figures which occupy the later volumes.

The investigation is probably the most complete and thorough that has ever been made in regard to the develop-

ment of prices. The wholesale prices of 223 articles were obtained from 1860 to 1891, and the prices of 90 of these articles was secured for the whole period from 1840 to 1891. There are returns of wages for 443 distinct series of laborers, covering 21 occupations, running from 1860 to 1891; while for 61 of these series returns were obtained for the whole period from 1840 to 1891. There are elaborate data as to the development of transportation rates by rail and water. There is hardly a phase of the economic history of the United States on which the economist will not find valuable material in this great collection. In the present paper I shall discuss only the results in regard to the development of prices, and even as to these can touch on some of the more interesting topics only.

The first, and perhaps the most interesting point of all, is the method by which a general expression of the course of prices, from year to year, was obtained. The familiar index-number method was followed by Prof. Falkner, but followed with exceptional skill and with some variations from the customary applications of it. In preparing the index numbers the year 1860 was selected as a base, all prices in that year being indicated by the number 100. The selection of this year was due partly to the peculiar industrial conditions of the United States, and partly to the circumstance that many of the statistics could be carried back farther than 1860. It was a normal year, marked by prices neither much higher nor much lower than those of the years immediately before and after; it preceded the Civil War, giving a convenient standard for measuring the effects of the paper money issues of the War; it was the first year for which the figures were secured for the whole list of 223 articles. The prices for this year being, then, selected for the base, the prices for other years were indicated by their index numbers in relation to this standard. In averaging the index numbers, and so securing the general index number for earlier and later years, two methods were followed: the method of simple arithmetical

average, and that of the average weighted or modified according to the importance of the articles. The mode in which the weighted average was used, and the extent to which the results so secured differ from those of the simple arithmetical average, are among the most important features of the investigation.

The weighted average was applied by assigning importance to different commodities in proportion to their importance in the budget of expenditures of families of moderate means. In budgets gathered by the Department of Labor the items of expenditure of workingmen's families for food, clothing, and other things were ascertained, and weight was given to the different commodities, in making up the general average, according to their importance in these budgets. This method of weighting differs from that employed by Mr. Palgrave and by some German economists, who assign importance to different commodities according to the part which they bear in the total expenditure of the whole community. The results of the two methods must be the same if the share which a particular commodity had in the expenditure of the family type selected were the same as its proportion in the total expenditure of the community. But if the family type selected were that of the workingman, as in the Committee's report, it is probable that the results of the two methods would differ. Which is the better must depend upon the objects sought to be obtained. If a social object is had in view—if it is desired to learn whether the purchasing power of a workman's income has risen or fallen—the budget method is clearly the better. If the monetary problem alone is had in view—if it is desired to ascertain whether a given sum of money will buy more or less commodities at large—the method of importance according to general expenditure is the better.

Another question of much interest in the technique of statistics is that of the feasibility of carrying out the budget method. There are obviously great difficulties in ascertaining what proportion of the expenditure of the workman's

family goes to many of the articles whose prices are quoted. Prof. Falkner has met these difficulties with great skill, and, although he has been compelled to resort to suppositions and combinations of a somewhat artificial character, he has, nevertheless, surmounted the practical difficulties of the budget method with a high degree of success.

Turning now to the results secured by these two methods we find a surprising agreement. The main results are shown on Chart I, where the two lines indicate, one, the general range of prices as ascertained by the simple arithmetical average; the other, the general range of prices as ascertained by the weighted average. They run together with remarkable closeness. During the years from 1840 to 1860 they diverge somewhat, the weighted average being lower than the simple average. The divergence may arise because the prices of a smaller number of articles were ascertained in this earlier period, and may be due to the fact that food, which of course affects the weighted average more than the arithmetical average, was then lower. But in the thirty years from 1860 to 1891 the results are in remarkably close correspondence. The extraordinary rise in prices due to the paper issues of the Civil War comes out with dramatic force, while the fall in prices from the close of the war to the resumption of specie payments in 1879 is equally patent. After 1879 there is first a slight rise, during the period of activity which set in with the year 1880, then a slow but fairly steady tendency to a fall. For further comparison with the United States prices the course of prices in Europe, according to the index number prepared by the late Prof. Soetbeer, and in the United States according to the present investigation, are shown on the second chart. The Soetbeer figures, it will be remembered, are computed from the arithmetical average of the prices of 114 articles, and may be fairly compared with the average similarly computed for United States prices.

Another problem on which the report throws light, though not so much light as might be desired, is the relation of the

CHART I.

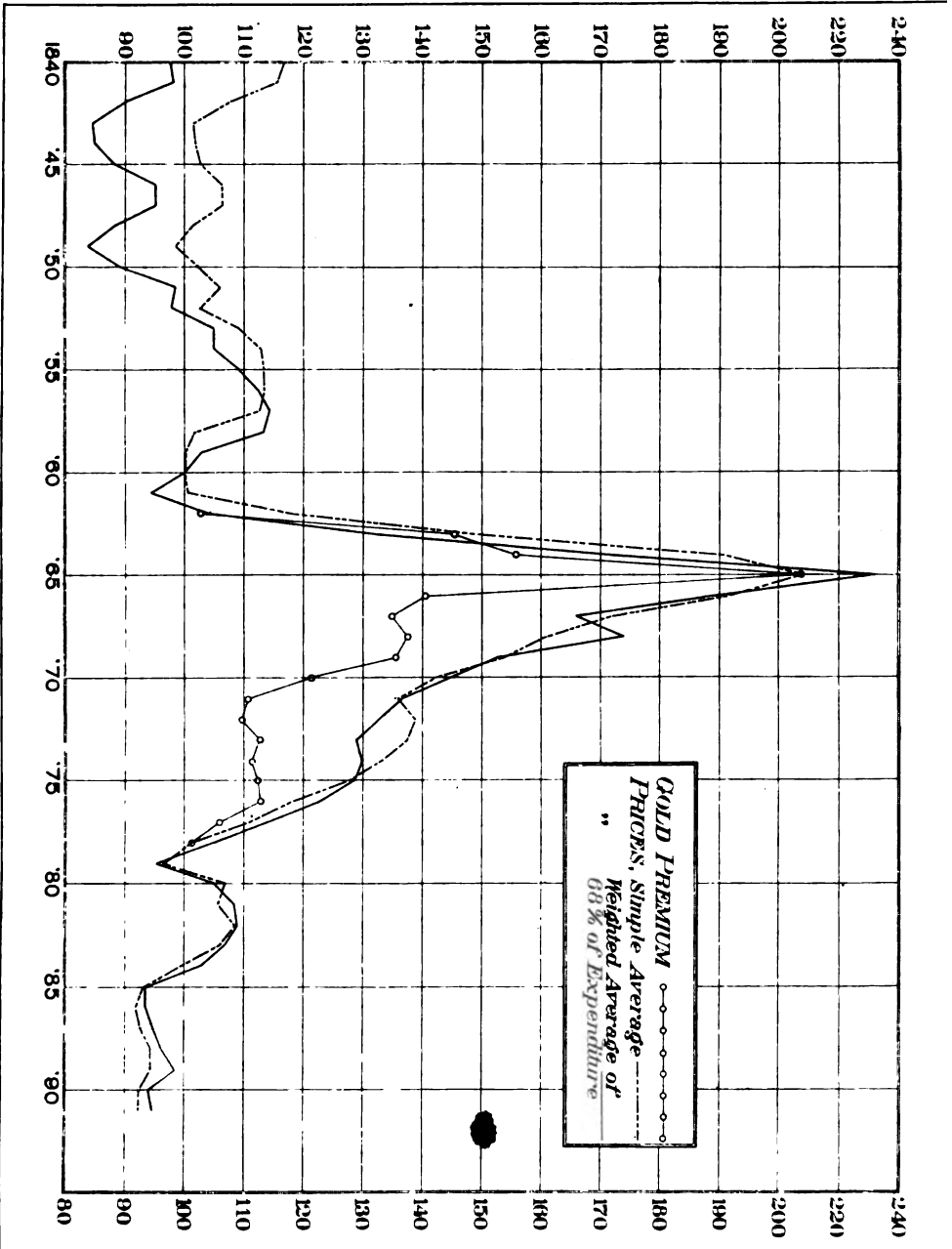
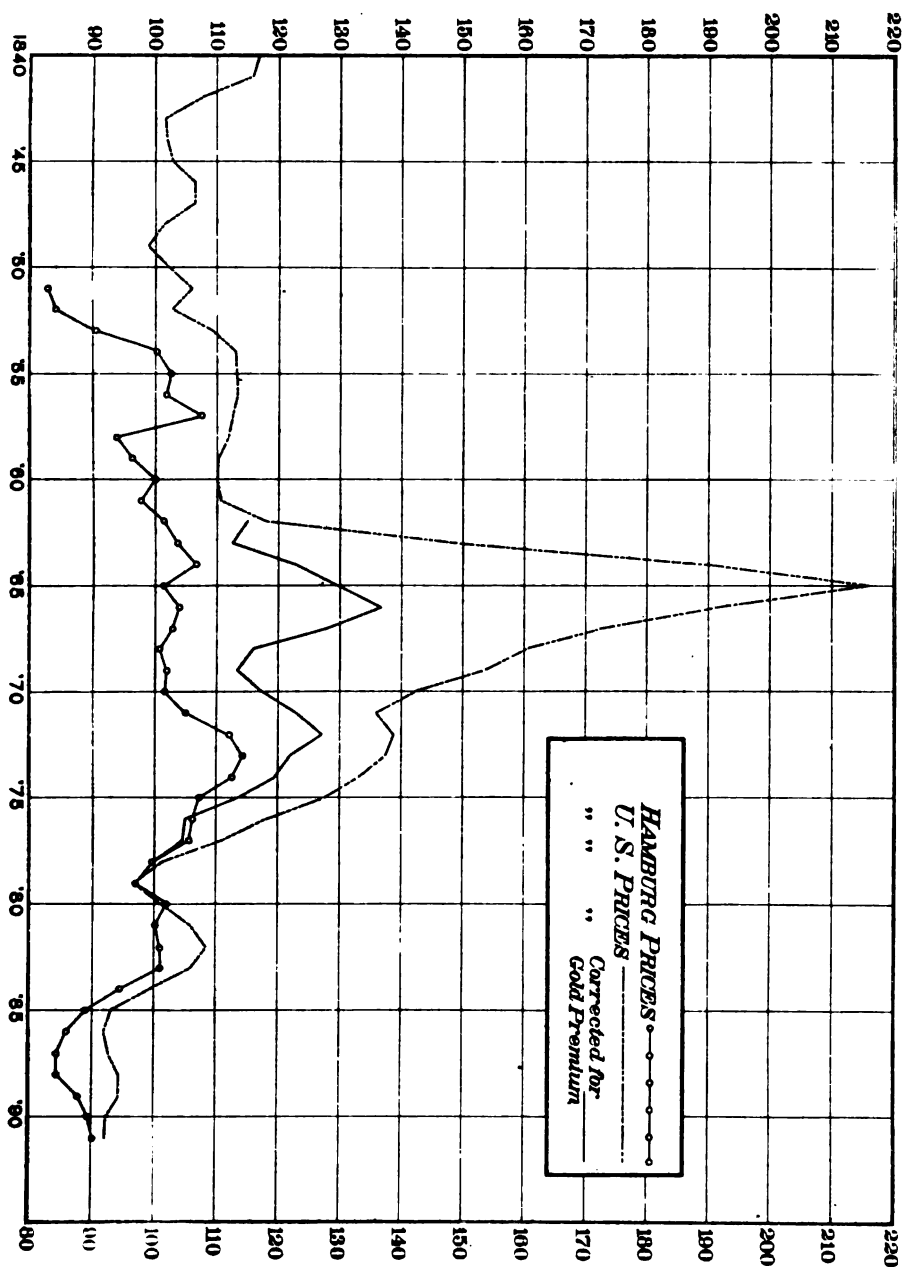


CHART II.



premium on specie to the general range of prices during the period of suspended payments. While the premium on specie may be taken for some purposes as a measure of the depreciation of inconvertible paper, the real depreciation is measured by the general rise in prices over what they would have been under a specie standard. With that general rise the premium on specie may or may not correspond. For the purpose of illustrating the result on this point the course of the specie premium has been indicated on Chart I, and may be compared with the movement of prices as ascertained by the simple arithmetical average. Unfortunately, the comparison is not sufficiently complete. The prices ascertained and averaged are the January prices of each year; to make possible a direct comparison the line indicating the course of the specie premium had therefore to be derived from the January quotations of gold for each year. But the premium on gold fluctuated so violently from 1862 to 1866 that these January quotations give us by no means an accurate picture of the course of the gold premium; and it is probable that the January quotations of prices during this period are similarly unsatisfactory as indicating the general movement of prices during these years of confusion. The comparison of the two therefore cannot be considered very valuable for these earlier years. After 1866, or 1867, the fluctuations both in prices and in gold premium were less abrupt. The January quotations of the two are more comparable and more trustworthy as indicating the situation for the year, and the lines of the Chart are more instructive. It will be seen that the gold premium sinks more rapidly than does the course of general prices. In other words, the real depreciation of the currency was then greater than the gold premium indicated.

*Synopsis.]***GEOGRAPHICAL CONCENTRATION: AN HISTORIC
FEATURE OF AMERICAN AGRICULTURE.****BY JOHN HYDE,****EXPERT SPECIAL AGENT IN CHARGE OF THE STATISTICS OF AGRICULTURE,
ELEVENTH U. S. CENSUS.**

The agriculture of a country, the capabilities of which are so enormous that its annual production of a single cereal is measured by billions of bushels, and which in the ten years ending June 30, 1890, sold \$5,639,203,272 worth of its agricultural products to other nations after supplying the requirements of its own large population; a country whose climatic range extends from the sub-arctic to the sub-tropic, modified by the greatest lake system and two of the greatest mountain ranges in the world, and with a mean annual rainfall varying from 1.85 inches in its most arid region to 105.25 inches in its region of greatest precipitation; a country occupied by so composite a people that in three of the greatest agricultural states in the Union, including the state that stands first in the production of wheat, the foreign-born element in the agricultural population out-numbers the native, while in another great agricultural state there are 136 negroes to every 100 whites,—the agriculture of such a country necessarily possesses many features of great interest. Among them is that tendency to geographical concentration which has always characterized the cultivation of many of the principal products of the soil. Reference is not made to those limitations of the area of production which are imposed by the conditions of climate, as in the case of the sub-tropical products of the states bordering on the Gulf of Mexico, but only to products that have a wide climatic range, such as the principal cereals, tobacco, flax, hemp, hops, etc., the cultivation of which has always been distinguished by a more or less remarkable geographical concentration.

Maize is cultivated to a greater or less extent from the most easterly county in the State of Maine to the most westerly in the State of Washington, and from the valley of the Red River of the North to the confines of the Everglades of Florida, and yet at no agricultural census ever taken has there been less than 38.57 per cent of the total crop produced in what have been for the time being the four leading maize-producing states, while the proportion has been as high as 52.36 per cent, and was 50.80 per cent at the last census. Of the total wheat crop of 1839, 61.52 per cent was produced in four states containing only 5.84 per cent of the entire land surface of the country. Fifty years later those states produced only 15.66 per cent of the total, and four others, containing 11.01 per cent of the total land surface, produced 35.85 per cent of the total crop. Of the total production of oats in 1839 56.20 per cent was produced in four states, containing 5.84 per cent of the entire land surface of the country. In 1889 48.82 per cent was grown in four other states, containing 8.25 per cent of the total land surface. Although the enormous increase in the cultivation of oats between 1879 and 1889 was more generally distributed over the entire country than the increase in any other important product, the percentage of the total crop of the country grown in the four states of largest production was even greater in 1889 than in 1879. The concentration of the production of barley has been still more remarkable. In 1839 the State of New York produced 60.56 per cent of the total crop of the country. Fifty years later the combined crops of the three states leading in the production of this grain constituted 58.95 per cent of the total, those of two other states increasing the proportion to 81.06 per cent. Barley has a very wide climatic range, its limit of successful cultivation extending farther north than that of any other cereal, while it can also be profitably grown in sub-tropical regions. Nevertheless, its production in the United States is practically confined to a few states, and always falls short of the demand. In 1839 over

one-half of the rye crop of the country was contributed by two states, and in 1889 the three leading rye-producing states of that time produced 38.92 per cent of the total crop. At six successive decennial censuses over 60 per cent of the total production of buckwheat has been raised in New York and Pennsylvania. In 1839 58.76 per cent of the total tobacco crop was raised in two states. In 1889 the same states produced 55.38 per cent, although this product has an exceedingly wide range of profitable cultivation. In 1849 the four states producing the largest quantity of flaxseed raised 66.68 per cent of the entire crop. In 1889 four other states, then leading, produced 80.06 per cent of the total. Hemp flourishes from the White Sea to the Mediterranean, and over extensive regions in three other continents, yet its cultivation in the United States is almost entirely confined to ten counties in Kentucky, notwithstanding that the production is sufficient for the requirements of the country. In 1849 72.53 per cent, and in 1889 51.22 per cent, of the total hop crop of the country was produced in New York.

The tendency henceforward, however, will almost certainly be toward decentralization. The multiplied wants of a rapidly increasing population, together with a general recognition of the advantages of mixed farming, have already greatly diversified the agriculture even of the newer regions west of the Mississippi River. Minnesota, which in 1889 led the entire country in the production of wheat, had its total cereal-producing area of 6,297,044 acres more evenly distributed among the different grains than was that of any other state in the Union. It is only a few years since, in the great wheat belt of North Dakota, it was impossible to procure eggs, butter, cheese, or fruit that had not been brought hundreds of miles from some leading produce market, or some agricultural district that was not so completely given up to a single branch of the industry. Now all this is changed. The practical exhaustion of the public domain, the necessity—soon to become apparent—of a more considerate treat-

ment of the soil on the part of the farmers of the western states, the establishment of agricultural experiment stations, and the extension of manufactures will contribute still further toward the diversification of agriculture. There will, however, in all probability, continue to be certain localities given up almost entirely to the cultivation of particular products without possessing any especial advantages for so doing, either in the way of soil, climate, or facilities of transportation.

*Synopsis.]*THE COURSE OF WAGES IN THE UNITED STATES
SINCE 1840.

BY CARROLL D. WRIGHT,

UNITED STATES COMMISSIONER OF LABOR.

The data for this paper are taken from a report of the Committee on Finance of the United States Senate, but they were largely collected by the Department of Labor, and therefore under my personal supervision. The statistics of wages include the rates of wages paid in nearly 100 distinct establishments, covering 22 industries, for the period from 1840 to 1891, inclusive. Only the general rates of wages as shown by the report of the committee referred to form the subject of the paper, but these statistics cover each year during the whole course of the period, so far as establishments could be found able to furnish pay-rolls for the whole period, or for any major part of it, and all the quotations given are taken directly from pay-rolls themselves. Of course, great difficulty arose in finding establishments which could furnish consecutive pay-rolls for all the years of the period comprehended, yet in a sufficiently large number of cases conditions favorable to an accurate report were found to exist. There is, therefore, for the first time in this country, a continuous record of the rates of wages paid in the principal industries of the country for a long period of years. An exception to this statement is made by reference to the valuable work published in the Tenth Census, compiled by Mr. Joseph D. Weeks.

Only nominal wages therefore are dealt with in the paper. To treat of the real or economic wages would have taken me too far afield.

The method adopted for ascertaining the general course of wages is that of selecting a particular year as a basis for cal-

culatation, and the year selected is 1860, as that represents more nearly than any other in the whole period a normal year. All quotations in all the industries reviewed are, for 1860, put at 100. Fluctuations each side of 1860 are therefore represented by fractional parts of 100, as, for instance, if a man received \$1 per day in 1860, which has been represented by 100, and in 1885 he received \$1.75 per day, then the entry for 1885 would be 175; and if in 1840 he received 87 cents per day, the entry for comparison with 1860 would be, for 1840, 87. This simple method was adopted by the Senate Committee on Finance, and all the calculations in their report made in accordance therewith. The same method was adopted in making comparisons as to prices of commodities, the committee having in mind always the relation which each principal article bore to the total consumption.

The various individual statements relative to industries and localities are taken up, showing the course of wages since 1840. These need not be reported in this abstract, but as a general conclusion of the paper, so far as wages are concerned, the following table represents, on the basis already described, the results for all the industries:—

RATES OF WAGES FOR 52 YEARS—RELATIVE WAGES, BY INDUSTRIES.

GENERAL AVERAGE OF WAGES.

Year.	Agricultural Implements.	Ale, Beer, and Porter.	Books and Newspapers.	Building Trades.	Car- riages and Wagons.	City Public Works.	Cotton Goods.	Dry Goods.	Ging- hams.	Grocer- ies.	Illumi- nating Gas.
1840	.....	.....	.....	85.0	100.0	.....	86.0	.....	.....	.....	92.7
1841	.....	.....	.....	85.0	100.0	.....	80.6	.....	.....	.....	94.3
1842	.....	.....	68.6	86.2	100.0	.....	87.5	.....	.....	.....	91.3
1843	.....	78.2	72.3	84.7	100.0	.....	87.6	.....	.....	.....	93.1
1844	.....	68.8	73.8	85.0	100.0	.....	85.7	.....	.....	.....	93.4
1845	.....	.....	74.8	86.6	100.0	.....	86.6	.....	.....	.....	96.4
1846	.....	.....	77.3	88.9	100.0	.....	90.8	.....	.....	.....	93.8
1847	.....	.....	78.2	92.6	100.0	.....	91.9	.....	.....	.....	95.2
1848	.....	.....	81.6	92.0	100.0	.....	93.4	.....	.....	.....	96.6
1849	.....	.....	85.3	89.6	100.0	.....	94.5	.....	94.2	.....	93.7
1850	.....	.....	89.1	86.2	100.0	.....	93.9	102.7	98.1	.....	94.6
1851	.....	.....	80.3	87.9	100.0	.....	87.7	102.7	94.5	.....	94.6
1852	.....	.....	82.1	88.7	100.0	.....	87.9	102.7	94.5	.....	92.9
1853	.....	.....	84.7	90.6	100.0	.....	90.4	102.7	94.6	.....	95.3
1854	.....	98.8	86.8	93.4	100.0	102.1	94.5	102.7	97.0	.....	98.1
1855	.....	84.5	88.9	95.7	100.0	103.1	98.7	102.7	99.0	100.0	100.5
1856	.....	90.6	86.1	96.5	100.0	100.2	101.2	102.7	101.1	100.0	99.4
1857	98.0	93.0	92.0	98.7	100.0	102.1	102.0	102.7	101.9	100.0	99.5
1858	103.1	96.0	98.0	95.8	100.0	97.5	96.9	102.7	101.9	100.0	99.0
1859	94.9	97.2	97.2	100.8	100.0	102.5	98.6	100.0	102.9	100.0	100.2
1860	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1861	102.1	105.3	96.6	100.4	100.0	98.4	98.9	.....	101.2	100.0	100.9
1862	99.8	115.4	98.9	106.3	169.9	97.8	94.2	100.0	102.8	145.2	101.6
1863	105.5	116.1	103.5	119.7	169.9	108.7	106.0	126.9	104.4	159.5	113.7
1864	111.7	127.8	114.0	143.7	169.9	135.8	122.3	126.9	106.7	159.5	141.6
1865	141.9	134.0	135.0	161.1	169.9	150.8	134.7	135.7	123.2	159.5	164.0
1866	156.8	157.7	139.2	170.0	169.9	154.4	153.2	135.7	146.0	159.5	171.0
1867	155.6	158.9	145.4	185.1	169.9	165.0	160.4	135.7	151.5	159.5	172.8
1868	152.3	163.9	156.0	185.5	169.9	169.9	160.9	135.7	153.7	159.5	182.9
1869	151.5	168.3	157.7	189.2	179.9	171.4	161.8	134.3	153.1	159.5	188.0
1870	152.6	168.5	156.1	185.5	179.9	172.9	160.6	134.3	154.2	147.5	186.1
1871	152.1	168.1	159.8	182.7	179.9	175.3	165.3	134.3	161.9	147.5	188.9
1872	154.0	169.1	159.4	183.3	179.9	182.4	169.0	132.8	164.2	147.5	189.4
1873	152.4	172.4	164.0	179.4	179.9	177.5	167.2	132.8	165.5	147.5	207.0
1874	157.1	178.2	159.3	178.1	179.9	179.5	155.8	132.8	163.3	147.5	201.7
1875	158.5	174.6	159.2	169.2	179.9	178.8	150.3	132.8	158.2	157.2	193.7
1876	141.3	159.4	155.9	158.6	179.9	168.0	142.1	132.8	156.9	157.2	190.3
1877	129.4	159.4	150.7	146.3	179.9	155.1	135.5	132.8	149.8	157.2	180.1
1878	130.6	179.2	145.6	140.7	179.9	141.9	135.3	134.0	148.5	159.5	174.2
1879	128.1	171.7	141.9	137.9	179.9	138.7	138.2	134.0	147.3	159.5	159.4
1880	124.9	176.2	140.7	142.7	202.4	141.5	139.9	134.0	143.8	159.5	154.3
1881	124.6	182.4	141.3	160.1	202.4	145.5	144.8	134.0	146.0	159.5	158.1
1882	133.4	183.7	139.0	165.1	202.4	151.9	146.8	134.0	147.5	159.5	163.2
1883	139.8	158.5	140.6	166.0	202.4	158.4	140.5	.....	148.9	159.5	168.3
1884	137.7	177.6	142.6	168.5	202.4	162.0	146.6	132.8	144.1	159.5	166.2
1885	132.0	179.9	145.2	169.9	202.4	162.8	143.5	132.8	137.4	194.7	166.4
1886	140.0	180.2	143.5	170.3	202.4	163.5	147.0	135.7	137.0	194.7	164.5
1887	140.3	202.1	144.0	170.1	202.4	163.8	150.6	135.7	143.3	194.7	163.8
1888	139.0	225.2	146.1	170.9	202.4	166.0	153.7	135.7	145.2	194.7	166.5
1889	137.8	224.7	148.7	170.1	202.4	164.8	157.0	162.6	146.5	194.7	166.8
1890	139.0	224.5	147.6	172.7	202.4	164.8	159.7	185.3	152.4	194.7	166.9
1891	137.9	224.7	148.6	172.5	202.4	164.6	165.1	183.6	152.7	194.7	167.7

RATES OF WAGES FOR 52 YEARS — RELATIVE WAGES, BY INDUSTRIES.—*Concluded.*

GENERAL AVERAGE OF WAGES.

Year.	Leath- er.	Lum- ber.	Metals and Metallic Goods.	Paper.	Rail- roads.	Side- walks.	Spice.	Stone.	White Lead.	Wool- len Goods.	All Indus- tries.
1840	.....	59.1	84.6	.....	89.5	.. ...	.....	80.4	90.7	.....	87.7
1841	.....	56.3	78.9	...	90.1	.....	.....	87.4	.....	.....	88.0
1842	.....	61.5	94.2	...	91.2	87.5	.....	79.2	73.8	.....	87.1
1843	.....	70.7	85.1	.....	90.6	87.5	.....	71.8	73.8	.....	86.6
1844	.....	76.0	88.5	.....	89.0	87.5	.....	76.5	73.8	.....	86.5
1845	.....	89.9	83.3	.....	89.6	87.5	.....	80.2	89.5	.....	86.8
1846	.....	92.8	85.7	.....	89.9	87.5	.....	97.8	91.8	.....	89.3
1847	.....	93.8	89.2	.....	92.0	87.5	.....	85.9	89.3	.....	90.8
1848	.....	100.7	89.4	.....	91.8	87.5	.....	82.9	89.3	.....	91.4
1849	.....	97.4	91.5	.....	90.6	87.5	.....	79.2	83.9	.....	92.5
1850	.....	91.8	88.8	.....	92.5	100.0	.....	93.6	88.6	94.0	92.7
1851	.....	91.3	88.5	.....	91.5	100.0	.....	93.8	93.7	94.1	90.4
1852	.....	90.7	89.9	.....	90.0	100.0	.....	96.1	94.2	94.3	90.8
1853	.....	95.3	89.9	.....	91.2	100.0	.....	99.7	93.9	94.9	91.8
1854	.....	99.0	95.8	.....	96.8	100.0	.....	103.7	100.9	95.2	95.8
1855	.....	100.0	98.6	.....	97.5	100.0	.....	98.8	94.5	95.4	98.0
1856	88.9	96.3	100.1	.....	96.9	100.0	.....	103.1	97.6	96.9	99.2
1857	84.4	90.8	101.7	.....	96.7	100.0	.....	103.3	96.6	97.4	99.9
1858	93.2	95.2	100.3	.....	97.0	100.0	.....	101.9	98.8	98.5	98.5
1859	102.6	96.5	98.4	97.6	98.6	100.0	.....	100.9	98.3	91.7	99.1
1860	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1861	110.6	103.6	102.2	100.0	103.3	100.0	100.4	90.7	101.4	103.1	100.8
1862	123.4	107.2	102.8	89.5	101.4	100.0	114.0	91.5	104.8	103.6	102.9
1863	138.4	131.8	106.5	107.2	103.0	112.6	98.5	109.5	109.9	111.7	110.5
1864	153.7	144.6	121.3	108.9	111.7	137.5	106.6	135.7	120.6	120.7	125.6
1865	160.4	153.2	144.9	143.6	133.0	175.0	134.9	146.8	130.3	137.3	143.1
1866	158.1	154.2	148.0	153.9	142.1	187.5	145.9	152.5	131.9	146.1	152.4
1867	151.7	157.1	151.2	161.3	150.7	.....	125.5	159.3	135.2	150.5	157.6
1868	150.7	163.7	153.6	171.4	154.2	.....	129.3	163.8	134.9	144.0	159.2
1869	152.1	165.5	156.3	171.9	157.2	212.5	118.6	169.8	154.5	149.1	162.0
1870	151.6	169.0	157.1	171.1	164.8	212.5	143.9	168.8	119.0	154.5	162.2
1871	153.4	168.1	155.6	173.9	164.4	200.0	122.2	169.9	136.1	155.1	163.6
1872	153.3	172.6	157.7	176.5	164.1	200.0	157.2	173.0	128.9	156.1	166.0
1873	154.9	177.7	160.2	190.1	165.3	200.0	149.2	171.3	140.0	158.2	167.1
1874	153.0	179.5	157.2	181.8	164.5	181.3	143.5	166.7	144.8	148.1	161.5
1875	141.9	171.8	154.2	191.9	157.4	162.5	156.2	161.3	144.8	154.7	158.4
1876	136.4	173.0	149.1	207.1	147.4	150.0	161.1	153.8	136.4	151.8	152.5
1877	136.8	176.8	143.8	167.6	141.9	150.0	160.9	138.0	133.0	142.1	144.9
1878	139.1	177.9	140.6	146.0	136.3	150.0	162.7	137.4	113.0	144.0	142.5
1879	128.9	175.4	134.6	165.3	137.9	150.0	157.1	129.6	119.0	145.0	139.9
1880	131.3	173.3	134.3	158.5	143.8	150.0	151.6	128.7	117.4	151.6	141.5
1881	130.6	176.8	139.0	168.1	148.9	150.0	153.0	136.1	119.7	153.8	146.5
1882	131.6	175.3	144.0	170.2	146.0	181.3	144.2	149.5	124.4	155.7	149.9
1883	133.7	175.4	147.2	181.4	149.4	181.3	155.2	147.4	135.2	163.6	152.7
1884	134.3	169.9	147.0	178.2	147.2	181.3	158.8	150.1	121.1	166.7	152.7
1885	128.2	170.3	143.0	178.8	155.1	181.3	158.2	150.4	129.3	163.1	150.7
1886	132.0	169.6	139.6	181.5	146.5	181.3	156.0	152.5	135.4	165.3	150.9
1887	134.4	170.9	143.3	181.8	145.6	181.3	162.4	153.1	141.1	167.9	153.7
1888	134.9	170.6	144.6	179.1	149.1	181.3	161.0	156.8	140.6	165.6	155.4
1889	131.5	175.1	146.2	182.7	148.3	181.3	162.4	156.9	140.3	165.0	156.7
1890	132.4	176.7	148.0	175.2	147.0	181.3	164.0	161.9	140.8	168.0	158.9
1891	137.6	177.9	148.6	182.3	146.4	187.5	164.2	165.2	140.6	167.8	160.7

To show the relation of wages to prices through the same period, the following table, based on various methods of computation, is introduced for the prices of articles:—

RELATIVE PRICES IN EACH YEAR, 1840-1891, FOR ALL ARTICLES GROUPED BY DIFFERENT METHODS.

Year.	All articles simply averaged.	All articles averaged according to importance, certain expenditures being considered uniform.	All articles averaged according to importance, comprising 68.60 per cent of total expenditure.	Year.	All articles simply averaged.	All articles averaged according to importance, certain expenditures being considered uniform.	All articles averaged according to importance, comprising 68.60 per cent of total expenditure.
1840	116.8	98.5	97.7	1866	191.0	160.2	187.7
1841	115.8	98.7	98.1	1867	172.2	145.2	165.8
1842	107.8	93.2	90.1	1868	160.5	150.7	173.9
1843	101.5	89.3	84.3	1869	153.5	135.9	152.3
1844	101.9	89.8	85.0	1870	142.3	130.4	144.4
1845	102.8	92.1	88.2	1871	136.0	124.8	136.1
1846	106.4	96.7	95.2	1872	138.8	122.2	132.4
1847	106.5	96.7	95.2	1873	137.5	119.9	129.0
1848	101.4	92.0	88.3	1874	133.0	120.5	129.9
1849	98.7	88.9	83.5	1875	127.6	119.8	128.9
1850	102.3	92.6	89.2	1876	118.2	115.5	122.6
1851	105.9	99.1	98.6	1877	110.9	109.4	113.6
1852	102.7	98.5	97.9	1878	101.3	103.1	104.6
1853	109.1	103.4	105.0	1879	96.6	96.6	95.0
1854	112.9	103.4	105.0	1880	106.9	103.4	104.9
1855	113.1	106.3	109.2	1881	105.7	105.8	108.4
1856	113.2	108.5	112.3	1882	108.5	106.3	109.1
1857	112.5	109.6	114.0	1883	106.0	104.5	106.6
1858	101.8	109.1	113.2	1884	90.4	101.8	102.6
1859	100.2	102.0	102.9	1885	93.0	95.4	93.3
1860	100.0	100.0	100.0	1886	91.9	95.5	93.4
1861	100.6	95.9	94.1	1887	92.6	96.2	94.5
1862	117.8	102.8	104.1	1888	94.2	97.4	96.2
1863	148.6	122.1	132.2	1889	94.2	99.0	98.5
1864	190.5	149.4	172.1	1890	92.3	95.7	93.7
1865	216.8	190.7	232.2	1891	92.2	96.2	94.4

By the foregoing table it will be seen that, under whatever method, prices fell on the average about 5 per cent from 1860. As wages had increased to a very large percentage during the same period the relative purchasing power of wages, as indicated by the rates paid, becomes clearly apparent,

SOME RECENT RESULTS IN RAILWAY STATISTICS IN THE UNITED STATES.

· BY HENRY C. ADAMS, PH.D.

STATISTICIAN INTERSTATE COMMERCE COMMISSION.

The year 1887 marks a new period in the development of railway statistics in the United States. Previous to this time all official statistics, except those of the Census Office, were collected and compiled under the authority of the Railway Commissioners of the various states. As might have been expected, the requirements of the several states were not harmonious, nor was it possible for any state to carry its line of statistics very far.

Under such circumstances the first effort of the Division of Statistics, created by the Interstate Commerce Commission in the fall of 1887, was to establish uniformity in the nature and scope of questions asked of railways, and it is one of the most promising features of railway statistics in this country that by far the larger number of state railway commissions have adopted the form for annual report of carriers, drawn up by the Interstate Commerce Commission. Many other steps have been taken toward the establishment of uniformity, the most fruitful being those which brought the Statistical Division in direct contact with the auditors of the various railways. The ideal condition for the collection of railway statistics would be one in which accounts of all railways are grounded on a uniform system of book-keeping. This ideal has been constantly held in mind, and the Statistical Division has always endeavored to work in harmony with the American Railway Accounting Officers' Association, an association having for its chief aim the attainment of uniformity in methods of accounting. The Executive Committee of this Association is at present engaged upon the final revision of the classification of operating expenses, the underlying principles

of which have been already adopted by the Railway Commissioners of the several states. Mention is made of these facts to show the direction in which the railway statistics are moving in the United States.

Confining my remarks to the Interstate Commerce Commission, the entire attention of the Statistical Division has not, however, been addressed to the development of a more perfect form of report and of accounts. A few steps have been taken in what primarily may be termed "scientific investigation." Although the character of the Commission and the limited funds at its disposal have prevented it from entering upon many investigations of great promise, the barrier to progress occasioned by the small amount of money assigned to the Statistical Division has been in part overcome by the fact that the Superintendent of the Eleventh Census considered it wise to place the Division of Transportation under the direction of the Statistician of the Interstate Commerce Commission. This has resulted in making the two offices, to a certain degree, supplemental to each other. I speak of this because the line of facts to which I purpose calling your attention are in part the work of the Census Office, and as they have not yet been formally published it is appropriate to make special mention of the source from which they come.

In 1890 the first attempt was made to classify railway statistics by territorial groups. The necessity of some classification of this sort will be readily recognized. In a country which extends from the Atlantic to the Pacific, and from the Great Lakes to the Gulf; which has all varieties of climate; which produces cotton, tobacco, rice, meats, wheat, corn, and all other cereals with equal facility; which contains all the minerals and nearly all the woods; which has developed manufacturing in all of its forms, and in which manufactures are highly localized; and, lastly, which is more perfectly supplied with railway facilities than any other country in the world (the great variety of its industries and extent of its

territory taken into account);—in such a country, I say, an average of any line of facts cannot be regarded as a type of anything in particular, because the facts from which the averages are deduced are too various, and contain too many anomalous units. To show that this is true I insert here a table taken from the Report of Railway Statistics for the year 1890, published by the Interstate Commerce Commission, giving for the various groups into which the territory of the United States is divided certain averages fundamental in railway statistics.¹ (See next page.)

It requires but a glance at this table to perceive how large a class of statistical problems present themselves for consideration. Each column in the table suggests a separate problem. Without speaking specifically of each set of facts, however, I desire to call your attention to the average revenue

¹ The territorial groups referred to in the table may be roughly described as follows :—

GROUP I. This group embraces the states of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut.

GROUP II. This group embraces the states of New York, Pennsylvania, New Jersey, Delaware, and Maryland, exclusive of that portion of New York and Pennsylvania lying west of a line drawn from Buffalo to Pittsburg *via* Salamanca, and inclusive of that portion of West Virginia lying north of a line drawn from Parkersburg east to the boundary of Maryland.

GROUP III. This group embraces the states of Ohio, Indiana, and the southern Peninsula of Michigan; also that portion of the states of New York and Pennsylvania lying west of a line drawn from Buffalo to Pittsburg *via* Salamanca.

GROUP IV. This group embraces the states of Virginia, North Carolina, South Carolina, and that portion of the state of West Virginia lying south of a line drawn east from Parkersburg to the boundary of Maryland.

GROUP V. This group embraces the states of Kentucky, Tennessee, Mississippi, Alabama, Georgia, Florida, and that portion of Louisiana east of the Mississippi River.

GROUP VI. This group embraces the states of Illinois, Wisconsin, Iowa, Minnesota, the Northern Peninsula of the state of Michigan, and that portion of the states of North Dakota and South Dakota and Missouri lying east of the Missouri River.

GROUP VII. This group embraces the states of Montana, Wyoming, Nebraska, that portion of North Dakota and South Dakota lying west of the Missouri River, and that portion of the state of Colorado lying north of a line drawn east and west through Denver.

GROUP VIII. This group embraces the states of Kansas, Arkansas, that portion of the state of Missouri lying south of the Missouri River, that portion of the state of Colorado lying south of a line drawn east and west through Denver and the territories of Oklahoma Indian Territory, and that portion of New Mexico lying northeast of Santa Fe.

GROUP IX. This group embraces the state of Louisiana, exclusive of the portion lying east of the Mississippi River, the state of Texas, exclusive of that portion lying west of Oklahoma, and the portion of New Mexico lying southeast of Santa Fe.

GROUP X. This group embraces the states of California, Nevada, Oregon, Idaho, Washington, and the territories of Utah, Arizona, and that portion of the territory of New Mexico lying southwest of Santa Fe.

SUMMARY OF SELECTED ITEMS, BY GROUPS.

Territory Covered.	Gross Earnings per Mile of Line.	Operating Expenses per Mile of Line.	Locomotives per 100 Miles of Line.	Men Employed per 100 Miles of Line.	Passenger Mileage per Mile of Line.	Freight Mileage per Mile of Line.
Group I.....	\$10,444	\$7,075	28	716	233,530	383,605
Group II.....	15,829	10,275	46	1,167	183,121	1,348,107
Group III.....	7,785	5,322	24	576	85,572	793,763
Group IV.....	4,279	2,886	13	379	43,039	330,981
Group V.....	4,945	3,278	14	386	46,869	304,936
Group VI.....	5,195	3,324	15	359	50,059	376,403
Group VII...	5,128	3,007	12	328	46,148	269,866
Group VIII...	4,056	2,613	12	307	37,027	243,753
Group IX.....	4,331	3,278	11	303	33,561	245,732
Group X.....	5,836	3,871	13	280	67,196	191,806
United States	6,725	4,425	19	479	75,751	487,245

Territory Covered.	Revenue per Passenger per Mile.	Revenue per Ton per Mile.	Per Cent of Passenger Earnings to Total Earnings.	Per Cent of Freight Earnings to Total Earnings.	Value of Railway Property per Mile of Line. Computed at 5 per Cent on Basis of Earning Capacity.
	<i>Cents.</i>	<i>Cents.</i>			
Group I.....	1.912	1.373	47.50	51.36	\$57,867
Group II.....	2.029	.828	27.33	70.28	107,741
Group III.....	2.199	.695	28.72	69.33	45,941
Group IV.....	2.481	.844	30.94	66.93	25,177
Group V.....	2.465	1.061	29.16	67.77	30,206
Group VI.....	2.226	.961	26.87	70.97	36,406
Group VII.....	2.452	1.360	27.46	71.19	38,136
Group VIII.....	2.268	1.152	25.96	69.99	27,168
Group IX.....	2.583	1.303	23.88	74.42	14,593
Group X.....	2.308	1.651	34.85	61.74	22,672
United States.....	2.167	.941	29.41	68.23	42,374

per ton per mile in the several territorial groups, which varies, it will be observed, from .695 cents in Group III to 1.651 cents in Group X. Are there any figures at command which serve to explain in any degree this variation? It is this question to which I now invite your attention.

The factors generally accepted as determining railway charges are: physical characteristics of railways, the commercial condition under which transportation is carried on, and

the competitive condition to which railways are exposed. To measure the relative influence of these elements presents a practical problem of the utmost importance, and at the same time a scientific problem which commands the interest of statisticians. It is, indeed, the peculiar function of statistics to solve such a problem.

The importance of physical characteristics, the most significant of which are gradients, curves, and distance from coal supply, has been greatly overestimated, and it has been one of the results of recent railway statistics in this country to show that engineers have committed the error of laying too great stress upon curves and grade. I need not dwell upon this fact, for a glance at the average receipts per ton per mile for the ten territorial divisions, and a mental review of the relative difficulty in railway construction in them, will convince one that physical characteristics of lines cannot exert a great influence upon railway rates. We may then pass this factor without further consideration.

Under the head of commercial conditions, under which transportation is carried on, there are included quite a number of distinct and varying factors. Speaking generally, these are density and character of population served by railways, and the amount, density, and character of freight hauled. All these factors are capable of comparative measurement. Omitting, for the moment, the kind of freight peculiar to the various groups, the facts which throw light upon their commercial character are presented in the following table, which shows for each group the number of miles of railway, the population, the number of miles of line per 10,000 inhabitants, the number of miles of line per 100 square miles of territory, the amount of traffic measured in tons, the amount of traffic per inhabitant measured in ton miles, the density of traffic, the density of load, the average haul per ton as reported by the roads, and the percentage of freight received from connecting lines, and consequently calling for no loading expenses. There is also added to the table the rate per ton

per mile for each group, being the figures that are to be explained.

SUMMARY SHOWING COMMERCIAL CONDITION UNDER WHICH RAILWAYS WERE OPERATED, BY GROUPS, FOR YEAR ENDING JUNE 30, 1890.

Territory Covered.	Ton Miles per Inhabitant.	Ton Miles per Mile of Line.	Number of Tons in Train.	Average Haul per Ton.	Per Cent Freight Received from Connecting Lines.	Revenue per Ton per Mile.
						<i>Cents.</i>
Group I.....	606	383,505	122.29	69.04	51.00	1.373
Group II.....	1,688	1,348,107	218.26	90.59	52.00	.828
Group III.....	1,977	793,713	217.58	120.94	57.00	.695
Group IV.....	579	330,981	161.92	170.20	37.00	.844
Group V.....	534	304,936	138.49	107.11	38.00	1.061
Group VI.....	1,401	376,403	148.29	155.40	24.00	.961
Group VII.....	1,658	209,866	150.28	167.83	47.00	1.360
Group VIII.....	1,049	243,763	148.49	172.01	45.00	1.152
Group IX.....	659	245,732	123.70	224.08	36.00	1.303
Group X.....	831	191,806	123.04	193.55	27.00	1.651
Total, United States	1,213	487,245	175.12	119.72	48.00	.941

Territory Covered.	Miles of Line.	Population.	Number of Miles of Line per 10,000 Inhabitants.	Number of Miles of Line per 100 Square Miles of Territory.	Number of Millions of Tons Carried.
Group I.....	6,877.67	4,700,745	12.06	11.09	41.25
Group II.....	18,613.82	13,767,388	13.52	17.18	240.58
Group III.....	21,718.27	8,394,816	25.88	17.25	137.20
Group IV.....	9,032.08	4,945,827	18.28	6.49	16.84
Group V.....	18,635.09	9,059,032	20.59	6.22	45.20
Group VI.....	37,463.44	10,243,750	36.52	10.07	92.51
Group VII.....	8,886.93	1,433,888	62.02	2.15	14.16
Group VIII.....	20,355.20	4,019,929	41.45	5.57	30.00
Group IX.....	9,854.18	2,976,630	33.16	3.04	8.76
Group X.....	12,160.37	2,339,566	52.18	1.60	10.04
Total, United States....	163,597.05	62,801,576	26.05	5.51	636.54

A word of explanation may be necessary for the correct interpretation of the figures in the columns headed: The Average Haul per Ton, and Percentage of Freight Calling for no Loading Expenses. The average haul per ton for each

group is determined by dividing the aggregate of ton-mileage in each group by the total number of tons reported as carried. For each group taken by itself the averages of the table are correct if the figures are properly interpreted. For the United States as a whole, however, the true average haul per ton is 220 instead of 119 miles. The figure 119 is obtained by dividing the total ton-mileage by 636 millions of tons of freight, which is the aggregate of freight carried, as reported by all the lines. A classification of this freight has been made in the Census Office from which it appears that only 330 millions is taken up by the roads at their stations, the remainder being received from connecting roads. This shows that the true basis of railway operations is much nearer 330 millions of tons than 636 millions of tons, and that this figure should be accepted as the divisor in determining the average length of haul for each ton in the United States. The significant fact, so far as the cost of transportation is concerned, is that tonnage received from connecting roads is usually the occasion of no loading expenses, and, in the last column of the above table, I have made an estimate of the proportion of freight calling for no loading expenses in each of the several groups, using as the basis of this estimate the amount of freight reported in each group as originating on the line of the company making report, and the amount reported as received from connecting lines. With this explanation the figures in the above table may, I believe, be easily understood.

An expert might, perhaps, be able to read from a large number of averages in the above table the statistical law which they contained. In order, however, to render this task more easy I have subjected the most important data to a different arrangement. Thus, the table next inserted shows the order in which the several groups stand when arranged according to a plan of progression. For the purpose of explanation it will be observed that in the column headed "Revenue per Ton per Mile," the groups are arranged in order,

beginning with the group which shows the smallest and ending with the group which shows the largest revenue per ton per mile. In the other columns the order of progression is inverse to the density or quantity or significance of the factor considered.

The first fact which a consideration of the above table impresses is the remarkable coincidence between density of traffic and the number of railways per 100 square miles of territory, as shown by the order in which the groups arrange themselves in the second and third columns. Upon the basis of this exhibit one may with confidence assume that density of traffic and railway facilities are interchangeable terms.

Further observation discloses a certain degree of uniformity in the recurrence of the remaining items, and in their assignment to the revenue per ton per mile. To indicate this I have connected by lines several of the groups in the various columns of the table. Thus it will be observed that Groups II, III, V, IX, and X exhibit a fair degree of uniformity in the order in which they appear in the several columns of the table, so much so, indeed, that we are authorized to lay down, at least hypothetically, the law that railway charges vary according to the commercial conditions implied by the density of traffic, density of load, and exemption from loading expenses.

Of the groups which vary from this rule it will be observed that Groups IV and VI vary on account of the item, exemptions from loading expenses. In Group VI, for example, which in density of traffic and density of load stands third in order, one would be justified, I think, in saying that it would also stand third in revenue charges were it not for the high average of loading expenses which the railways of this group sustain. Group I, that is to say, the New England states, exhibits the greatest fluctuation, but the railways in this group in every particular stand apart from the railways of the other parts of the country. They are the only railways of the entire country which depend largely upon passenger as

compared with freight traffic, and they are also exempt, in large measure, from the competition to which other roads are exposed.

Group VIII shows a lower rate per ton per mile than might have been expected, while Group VII may be accepted as conforming fairly well to the general rule, if it be noticed that because roads of this group do not show either density of freight or density of load, the high relative charge for loading can bear but slight relative importance.

There is another very important commercial condition not represented in the above tables which must be noticed. I refer to the character of the freight carried by the railways of the various groups. In the following table, presented by courtesy of the Census Office, the total freight carried by the railways of the United States during the year 1890 is classified as products of agriculture, products of animals, products of mines, products of forest, manufactures, merchandise, and miscellaneous.

SUMMARY EXHIBITING THE FREIGHT TRAFFIC BY COMMODITIES OF THE RAILROADS OF THE UNITED STATES IN THE YEAR ENDING JUNE 30, 1890. ALL GROUPS.

Commodities.	Totals for United States.				
	Freight Originating on all Roads.	Freight Received from Connecting Lines and Other Carriers.	Unsegregated Tonnage.	Total Freight Tonnage.	Per Cent.
	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	<i>Tons.</i>	
Totals.....	274,112,866	258,981,868	107,357,814	640,452,548	100.00
Products of agriculture.....	28,865,536	41,041,868	16,629,253	86,536,657	13.51
" " animals.....	10,497,285	11,680,799	4,249,944	26,428,028	4.13
" " mines.....	129,977,648	115,244,678	26,323,374	271,545,700	42.40
" " forest.....	32,674,105	21,714,792	9,409,288	63,798,185	9.96
Manufactures.....	37,093,806	34,929,064	7,927,000	79,950,770	12.48
Merchandise.....	12,946,615	10,900,392	5,899,806	29,746,813	4.65
Miscellaneous (commodities mentioned above).....	22,057,871	23,469,375	36,919,149	82,446,395	12.87

The Census Office made a computation similar to the one presented in the above table for the United States for each of the territorial groups. In place, however, of producing these figures entire there will be found in the table on next page a statement of the aggregate number of tons carried in each group, and the percentage of each class of freight to this aggregate. There is also inserted a map of the United States which makes a graphic exhibit of these data.

Unless one's attention has been called to an analysis of railway freight, he will, I venture to say, be somewhat surprised at the above presentation. The average rate per ton per mile on all the railways of the United States is .860 cents. We have already discovered one reason for this apparently low rate in the fact that the average haul per ton is 220 miles, and now another reason for this low rate appears in the fact that by far the greater per cent of freight is low grade freight. Thus, agriculture, animal products, mines, and forests account together for nearly 75 per cent of total freight carried. Mines supply the railways with nearly 50 per cent of their total traffic.

The problem which we have set before us, however, pertains to the relative rates in the various groups, rather than the actual rate in the United States as a whole, and, without making a particular analysis of the freight carried in each group, a casual glance will show that this is a very important element in the making of rates. In Group II over 60 per cent of the total freight is the product of mines, and in Group III over 40 per cent, but in Group III forestry, agriculture, and animal products, low class freight, show a higher percentage than in Group II. This, taken in connection with the fact that Group III is most favorably situated of any group in the country as regards expense of loading, and, also, with the fact that railways within this group running north and south are heavily loaded with mineral products in both directions, fully explains why the average receipts per ton per mile are lower than in any other group. It is possi-

TABLE SHOWING RELATIVE AMOUNT OF FREIGHT, OF CLASSES NAMED, MOVED BY RAILWAYS IN THE SEVERAL TERRITORIAL GROUPS; ALSO AGGREGATE NUMBER OF TONS MOVED.

Class of Commodities.	Group I.	Group II.	Group III.	Group IV.	Group V.	Group VI.	Group VII.	Group VIII.	Group IX.	Group X.	The United States.
Agricultural products.....	10.14	8.40	13.62	14.07	15.88	20.55	18.96	23.76	20.39	21.24	13.51
Animal products.....	4.15	2.50	4.46	2.70	2.49	5.57	7.01	9.55	11.30	5.00	4.13
Mineral products.....	14.63	60.35	42.66	35.15	22.79	31.02	21.40	32.62	16.23	19.83	42.40
Forest products.....	6.05	6.65	12.13	16.10	12.16	10.87	9.15	12.82	25.09	18.49	9.96
Manufactures.....	7.60	13.67	17.68	15.69	11.92	7.60	5.14	4.57	9.83	11.62	12.48
Merchandise.....	7.38	2.89	4.69	6.56	5.62	5.12	3.83	8.11	9.46	15.20	4.65
Not classified.....	50.05	5.54	5.36	9.73	29.14	19.27	34.51	8.57	7.70	8.42	12.87
Aggregate number of tons carried.....	39,475,504	237,293,176	139,372,456	19,215,102	44,382,018	94,030,225	13,625,381	31,587,663	11,398,392	10,066,711	640,452,548

ble, also, that the competition which the railways of this group sustain with lake traffic has something to do with its low rate, although my personal opinion is that lake traffic is a less important element in forcing down railway rates than is commonly supposed. The truth is that steam vessels have forced sailing vessels to the wall, and the railways have captured the steam vessels.

I shall not extend this paper for the special analysis of the traffic of each group, but I cannot refrain from calling your attention to group IV. It is somewhat surprising that the receipts in this group are lower than in all other groups, with the exceptions of Group II and Group III. There is nothing in the commercial conditions to justify such low rates, and it is quite likely that this group is influenced more largely by water competition than any other in the United States.

This paper must be regarded as a contribution to the solution of the problem of railway rates. It certainly is not conclusive respecting them. It is believed, however, that it follows the logical order of treatment in that it endeavors to give a comparative measurement of the commercial conditions under which railway traffic is carried on, assuming that what, in this manner, cannot be explained must be referred to the financial condition of the various railways, and to the competitive conditions under which they are operated. The facts which it contains are the latest contributions to railway statistics in the United States.

I cannot close, however, without the suggestion that a schedule of rates which holds in mind the commercial and industrial interests of the public must adjust itself to the character of the industries whose products the railways carry. An investigation into the localization of industries, and the amount of various kinds of traffic originating in the several sections of the country, should be the basis upon which railway rates are adjusted.

THE CONDITION AND NEEDS OF STATISTICS OF MARRIAGE AND DIVORCE.

BY REV. SAMUEL W. DIKE, LL.D., AUBURNDALE, MASS.

This paper will offer some suggestions from the point of view of a student of the social problems of Marriage and Divorce. I am at present unable to carry out my original intention of presenting with it an exhibit of just what is done in the official statistics of various countries and states, together with a table showing the movement of marriages and divorces for the last twenty-five years. The great courtesy of many chiefs of European bureaus of statistics has supplied me not only with their recently published reports, but in most instances with the latest returns in manuscript. I am also under the greatest obligation to these officials for useful answers and suggestions in response to inquiries regarding the present condition of their statistical work in this particular field, and the improvements which they think should be made in it.

The importance of statistics of this class needs no argument. Statistics of Marriage and Divorce find their justification in their relation to the family, since they note its formation and dissolution. Those relating to marriage have, as a rule, been longer and more widely collected in Europe than those of divorce. In the United States statistics of divorce were collected in only a few states until the investigation, which was the basis of the Report of 1889, was made. These, as regards the number and some other leading facts, were practically complete for twenty years. But the statistics of marriage could be gathered for only a few states, and, unfortunately, at present only twenty-one states make any provision for the returns of marriages to any state officer, and but nine furnish statistics of divorce.

Among those who have studied the moral and political

aspects of divorce, Von Oettingen and Woolsey collected statistics for comparative study. But the paucity of official statistics and obstacles in the way of private research greatly restricted their laborious efforts. Sig. Bodio and M. Bertillon were the first among official statisticians to do important work in bringing together the divorce statistics of various countries. A few years later Mr. Wright, the Commissioner of Labor of the United States, acting under a special instruction from Congress to undertake the task, collected from original sources complete statistics of the fundamental facts concerning divorce in the United States for the years 1867-86 with such statistics of marriage as were available. He also brought together, chiefly from the original sources, the statistics of both marriage and divorce in most European countries and Canada. The value of this work was greatly increased by the analyses of the laws relating to those subjects so far as legislation throws light upon the statistics.

The work of Mr. Wright, in a volume of 1074 pages, brought together a vast amount of material for the study of the social and legal aspects of the problems relating to Marriage and Divorce, which, in the United States at least, have become of the greatest importance from the easy conditions of marriage and divorce, the great number and rapid increase of divorces, and the conflicting character of our state laws. Its value is already seen in the abandonment, for the present certainly, of the plan of uniform law through an amendment of the Constitution of the United States, for the experiment of uniform legislation by the coöperation of the state legislatures. For the Report showed that the facts regarding migration for divorce were almost the reverse of the popular opinion. But beyond this it has advanced statistical study of the subject in a way that shows the need of carrying the investigation in this country still farther, and the value of statistics for comparative study upon its subjects in all civilized countries. Anyone who carefully looks into the matter can hardly fail to see that the tendencies of the laws on marriage and

divorce, amid all their variety, have already been converging towards the adoption of certain common principles and points, and that the growing intimacies of the nations will lead to greater uniformity. The statistics of Japan, the numbers of whose marriages and divorces are now reported for the seven years 1884-90,* and the fact that the swift movements of that people towards Western civilization are being made while its domestic institutions are not yet brought under public law, and the significant changes in the divorce laws of Australia and France, with the wide spread disposition to challenge traditional authorities and conclusions, will all tend to increase the demand for the investigations and reports of the statistician.

On these subjects the student of social problems and the legislator and reformer will be best aided if each statistical office will use its resources for the collection and presentation of all the facts within its own field. Uniformity of method and form are desired rather than uniformity in the points included within the investigation, for everything has its value. The omission of a single point for a year or two may greatly disturb the student, or take away his only source of exact information on that particular point. The tabulation of first marriages, by age and sex, for a long period, for example, enables him to detect the difference in the comparative increase of the age at which the two sexes marry. Or the returns of deaths may give conjugal condition and thus show the number of marriages dissolved in a year by death as well as the death rate among the married and divorced.

The material for statistics of marriage, and generally the statistics themselves, in most European countries are so very nearly complete as to require little notice. Names, place and

* These are as follows :—

Year.	Marriages.	Divorces.
1884	287,842	109,906
1885	259,497	113,565
1886	315,311	117,964
1887	334,149	110,859
1888	330,246	109,175
1889	340,445	107,478
1890	325,141	109,088

date of birth, the past residence, and sometimes the intended residence, the age, number of the marriage and previous conjugal condition, religious faith, occupation or social position, are generally required in the original returns. The prevalence of the obligatory civil marriage, and the restrictions upon the jurisdiction of the clergy and civil officers, make exact and complete returns comparatively easy.

But in the United States the registration reports of only six or eight states are sufficiently full in detail or complete in returns to be entirely trustworthy, and about as many more are approximately complete. Only twenty-one states in 1886, as already mentioned, provided for any returns of marriages, and, as the report of Mr. Wright says, "These returns, as a rule, however, give but a few facts relative to the persons married, and these facts that are given are not identical, and are compiled so carelessly as to be nearly worthless." And he adds, "This report shows conclusively the necessity of complete records of marriages celebrated." The Massachusetts reports, which other states have followed, and those from one or two more, have generally been well made. But our separation of church and state, though curiously permitting the clergyman to be a civil officer for the purpose of celebrating marriages, has allowed us, quite unnecessarily I think, to omit all attempts to report the religious faith of those married. We have asked the occupation, but rarely tabulate the facts regarding it, and we never inquire into economic condition or other facts of social standing. If the time, place, and cause of the dissolution of the former marriage were required of all who marry a second time we should get sociological material of great value. The practice in Germany, and some other countries of Europe, of having each dissolution of a marriage, whether by death or divorce, reported and entered upon the original record of the marriage renders bigamy easy of detection.

In statistics of divorces or separation we should have, where practicable, the age of the parties, their nationality,

race, religious faith, occupation, and perhaps economic condition, residence by town or city, year and month of marriage, of application and decree of divorce, the number, age, and sex of the children of the parties, the dates and causes of the dissolution of all earlier marriages, as well as the sex of the applicant, the grounds on which the divorce or separation is sought and granted, and the number of applications refused. In the United States the length of the entire residence within the state where the divorce is granted, and the facts as to service of notice upon the defendant, should be ascertained. Then the statistics of pauperism, crime, insanity, and suicide should so report conjugal condition that the number of divorced who fall within these classes can be discovered.

So far as practicable I would have special investigations in marriage and divorce carried on to supplement the results of the ordinary periodical statistics. The divorces of Sweden, Belgium, and France are already reported for long periods of time. If these could be supplemented by figures running back for a long time in some other countries, and in some of the United States, we should get a good deal of light upon the relation of the movement of divorce to the great political, economic, and social changes of the period. Special inquiry may also contribute still more knowledge than we now have of the connection between divorce and suicide, intemperance, illiteracy, the home and hereditary conditions. The discussions of Bertillon and others on some of these points are fruitful of suggestions. Prof. Willcox, of Cornell,* has called attention to the apparent coincidences in the movements of trade, immigration, marriage, and divorce in the United States.

I would further suggest that the statistical offices of as many countries or states as may be practicable be invited to coöperate in the effort to secure greater completeness in this class of statistics, and that they or the Bulletins of the International Institute, and other statistical publications, bring together the summaries annually or at other regular periods,

* In the *Political Science Quarterly* for March, 1893.

preserving and continuing the results that have been hitherto secured. Statistical dictionaries and other hand-books should be careful not to vitiate official figures by the interpolation of estimates or mere guesses where the actual figures are unknown. I find, for example, in a popular Dictionary of Statistics an estimate of the divorces of Germany for years prior to those for which we have any official or other figures; an estimate of marriages in each one of the United States from the data supplied by the statistics of a very few of the older states; and, worse yet, a pure guess at the rate of illegitimate births for the United States as a whole. Such figures as these are sure to be quoted, often in reputable publications, as actually correct, or as entirely safe estimates. The general reader has little protection against such imposition.

Finally, I think the influence of statisticians and of public-spirited citizens should be used to secure from governments means of extending statistical work upon these subjects that through their relation to the family deeply concern the greatest social interests. If Great Britain and some other countries would provide for the publication, and in some cases the collection and publication, of statistics of divorce in some readily accessible form, many students would be grateful for the service. But the people in the United States especially need to be urged to bring their statistics of marriage and divorce to a more creditable place beside those of other nations than they now hold. The Commissioner of Labor, in making his Report in 1889, spoke in strong terms of the serious consequences of the careless way in which records of divorce are made and kept, and pointed out some of their defects and the need of a better system for the record and report of the marriage and divorces. His work has laid an admirable foundation upon which a fine system of statistics relating to this most important subject may be constructed. Public opinion should compel legislation that would correct this evil, and at the same time provide for full and trustworthy statistics.

RAILWAY STATISTICS AS APPLICABLE TO EARNINGS OF PASSENGER TRAINS.

BY M. RIEBENACK.

ASSISTANT COMPTROLLER PENNSYLVANIA RAILWAY COMPANY.

Availing myself of the latitude granted by your committee's representative in his letter conveying the information that I had been selected to prepare a paper on "Railway statistics as applicable to earnings of passenger trains, with a view of determining approximate revenue and deciding as to number and time of trains to be run for the accommodation of the public," I shall take the liberty, preliminary to entering upon a discussion of the subject, of making some reference to the accounting and passenger departments of American railways, and their functions as generally organized. These remarks will be of a general and explanatory character, calling attention to past conditions and the rapid growth and development of the railway passenger train service leading to the necessity for current statistics of the character it is proposed to describe.

The demand for reliable figures from which to obtain the earning capacity, as well as the current expenditures of railroads, in detail, was one of the principal causes for the establishment of the accounting department by railway corporations. This department—the auditing bureau—is the one to which railway managers turn for definite information in relation to current, general, and detailed earnings and expenditures of the road. It is there that specific and absolute attention is given to statistical details. This department also handles all data bearing upon the cost of management and operation of the road's various divisions and branches, whether on passenger or freight account, or on general or special business. These latter figures are audited, compiled, and reduced to statement form, in order to meet demands made for

comparative statements showing the cost of operation for any given period.

It is not the purpose to consume time by enumerating the almost infinite variety of items which affect the earnings of the passenger traffic. Past experiments and inventions of man in the mechanism and applications for railway passenger service are undergoing phenomenal evolution, the tendency of which is conspicuously and invariably for insuring safety, speed, and comfort. In a retrospective glance at the improvements and realizations of the last ten years in railroad operation we are at once amazed by the incontrovertible evidences of the great and sweeping advances that have been made in every avenue. Our locomotives are marvels of power and speed, having been brought to what we may almost consider a state of perfection by the inventive genius of the best mechanical minds. The model railway passenger train is a combined masterpiece, embodying the talent and ability of the inventor, car builder, upholsterer, artist, designer, and decorator, possessing sumptuousness, oriental luxury, rich coloring, striking effects, solid comfort, and every possible convenience.

The travelling public today receives from railroad companies for a given sum a much larger equivalent than formerly. It is hardly necessary to call to mind the old-time passenger shed, and the unsightly and uncomfortable cars, that comparisons may be had with today's magnificent railway structures, representing the highest architectural skill and large outlays in money, and the advantages of present car arrangements in such essential matters as heating, lighting, and ventilating, with the increased parlor, dining, buffet, sleeping, and observation car service. These introductions of improved service have largely banished the fatigue and discomfort incident to travel in the not very remote past, and transformed the tiresome railway journey into one of rest and enjoyment. The luxurious ease and unvarying comfort afforded by the famous solid vestibuled palatial cars are ren-

dered doubly enjoyable from the fact that the high speed attained is sustained with almost absolute safety.

Very properly and wisely are we impelled by financial interests to inquire into the means of providing the best train service warranted by the earnings derived from the passenger traffic. Tabulated statements of earnings and expenses, as well as numerous other data, in these closing days of the greatest century of civilization, have become truly wonderful aids to success, requiring the employment upon them of the best skill and ability of statistician and mathematician, under the supervision of railway officials of large experience and practical education.

For the owners of the millions of dollars now invested in railway property these annual or other statements invariably possess intense interest. No railway management should lose sight of the governing fact that the affairs of the company should be conducted in the best interests of its owners, to whom its general financial condition and earning capacity can only be made known through comprehensively and carefully compiled statements. In the past the study and compilation of railway statistics in the United States have not been conducted upon clearly defined lines, as a whole, calculated to produce beneficial or valuable results. On the contrary, they have been largely the creatures of individual preferences, as represented or dictated by the managers of the various roads, by whom they have been accordingly influenced. While some roads have adhered to records based upon similar methods of preparation others have ignored such records, or have been governed by plans totally dissimilar, thus occasioning confusion and rendering them of little value for practical purposes.

The annual joint conferences of the Interstate Commerce Commission and the representatives of the various state railway commissions (inaugurated about five years since) are fast developing a uniform basis for furnishing statistics. The results so obtained, if properly handled, will go far

towards solving what is termed the "railway problem." Divested of the mysticism commonly ascribed to the word "problem," this term "railway problem" means a just basis for rates, a due maintenance of the same, and the permanent establishment of measures preventive of injurious or unreasonable discriminations.

When I entered the passenger service of the Pennsylvania Railroad Company in 1865, one of the most complicated questions vexing and perplexing the operating officers of the road was in the form of petitions and letters from patrons of the line inviting, arguing for, and demanding increased train service, especially at terminal points and principal cities along the road. The Pennsylvania then had a passenger revenue of \$6,376,079.14 per annum, and carried 3,611,086 passengers.

Since 1859 there has been in operation a system of daily train reporting by ticket agents, exhibiting the sales of all local tickets. An effort was directed toward the consolidation of train information on the basis of these reports, and approximating the sales of all other kinds of tickets, thereby providing a means of dividing the revenue arising therefrom among the various trains. This plan proved very unsatisfactory, as it required a large clerical force at the company's general office, and it was impossible to obtain the results until months after the business had passed over the line, so that it was finally abandoned and the information desired sought for in other directions.

The devising of more efficient means for this purpose was not pushed to practical completion until another problem confronted the company in the shape of the anticipated heavy travel incident to the Centennial Exposition in Philadelphia in 1876. Finding that the then limited number of passenger trainmen would be unable to cope with the increased volume of passenger business during that exposition it was suggested that freight crews could be pressed into passenger service. This suggestion was embarrassed by the fact that those

employees were not competent to deal with the various complications and limitations incident to the tickets then in use. The company met the question in the fall of 1875 and spring of 1876 by the employment of young men who had previous experience in commercial life, to whom were given full and complete instructions respecting the kinds, conditions, and peculiarities of tickets, with a view to engaging their services solely for the collection of tickets and fares on trains. They were drilled also in the knowledge of time-tables, the baggage checking system, and other duties requiring intelligence and reliability in their relation to passengers. These employees were known as "train agents," to distinguish them from conductors, the latter being in full charge on the train with the former as aids. The selection of train agents was made on the basis of gentlemanly appearance and deportment, as well as clerical ability, which would equip them acceptably for contact with the travelling public. One of their most important duties was the preparation of reports exhibiting in detail the entire travel on the several trains, thus furnishing the solution of the problem as to the obtaining of satisfactory train information.

To further the handling of the business, and improve the character of reports of the traffic, there was inaugurated a system of "ticket receivers." Competent men, selected from the general office staff and designated as ticket receivers, were appointed and placed at terminal or other important stations to receive cash and ticket collections from conductors and train agents, to make up statements of the business and money value of each run made, and to adjust differences with passengers, which were unavoidable under the pressure of so large a business of a new character coming on the line.

At the close of the Centennial Exposition there arose the question of the advisability of continuing the service of train agents, or returning to the old system of conductors. Economic features largely influenced the decision of this question, which resulted in the restoration of the former system

of conductors, but under changed conditions. The ticket receivers' system was continued and extended under enlarged powers, and a high standard of qualification required of parties in charge of such offices.

The ticket receivers, as well as the clerks in their offices, receive a thorough training in the auditor's office before appointment to the position, so as to be well versed in all the rules and regulations of the department connected with the business of passenger transportation, have a geographical knowledge of railroads and connecting points, and possess good judgment to the end that their decisions pertaining to the validity of tickets, or other matters about which there may be a disagreement among passengers and conductors, shall be equitable as between passengers and the company.

The conditions under which conductors were assigned to passenger trains were also changed, and a higher grade of efficiency demanded. In addition to passing an examination from a transportation standpoint, they are now required to be instructed and to pass an examination in the auditor's office, to demonstrate their qualifications for accounting duties, before they are placed in charge of passenger trains. They must prove themselves possessed of fair education, good clerical abilities, and a thoroughly practical knowledge of the classes and conditions of tickets which are presented on trains as equivalents for rides, and must have an intelligent conception of any and all relations that may arise among passengers and the company. As a result of the instructions given and a subsequent examination they are classified and graded. Those passing No. 1 or No. 2 are assigned the most important runs; those passing No. 3 are assigned to such runs as do not offer so great variety and complication in tickets and information.

Illustrative of the increased knowledge necessary — owing to the expansion of territory and variety of travel — for the proper handling of train business, the following comparative table is given, showing the classes of tickets in use in the current year, 1893, as contrasted with those of 1872: —

LOCAL.—AS APPLICABLE TO TRAFFIC ORIGINATING AT AND DESTINED TO POINTS
ON SAME LINE.

1893.	1893.—Continued.	1872.
Regular.	54-trip employees'.	Regular.
2nd class.	60-trip.	Commercial.
Accommodation.	60-trip employees'.	Accommodation.
Special.	Quarterly.	Accommodation special.
Special employees'.	Quarterly employees'.	Special.
Strip.	Strip employees'.	Emigrant.
Limited.	Workmen's.	Emigrant special.
Continuous passage.	Workmen's 50-trip.	Clerical.
Clerical.	Workmen's 54-trip.	Excursion.
Excursion.	Annual.	Excursion special.
Excursion comb. and sea- shore.	100-trip season.	Excursion summer.
Excursion special.	100-trip annual.	10-trip.
Excursion two-day.	150-trip.	12-trip.
Excursion five-day.	150-trip season.	18-trip.
Excursion employees'.	150-trip season, employees'.	25-trip.
Excursion summer.	300-trip annual.	16-trip.
Excursion summer special.	360-trip.	26-trip.
10-trip workmen's.	Irregular commutation.	30-trip.
10-trip.	Parlor car.	46-trip.
20-trip employees'.	Street car (agents).	50-trip.
25-trip.	Regular conductors'.	54-trip.
26-trip.	Accommodation conductors'.	Quarterly.
46-trip.	Clerical conductors'.	Commutation.
46-trip employees'.	Excursion conductors'.	Regular conductors'.
50-trip.	Excursion two-day conductors'.	Special conductors'.
50-trip employees'.	Street car conductors'.	Emigrant conductors'.
50-trip special.	Parlor car conductors'.	Excursion conductors'.
50-trip season.		75-trip.
54-trip.		100-trip.
		Employees' Commutation.

INTER-ROAD.—AS APPLICABLE TO TRAFFIC ORIGINATING ON A CERTAIN LINE AND
DESTINED TO POINTS ON ANOTHER LINE.

1893.	1893.—Continued.	1872.
First-class.	Excursion summer special.	First class.
Limited.	Excursion winter.	Second class.
Second-class.	Excursion winter special.	Special.
Special.	Excursion comb. and seashore.	Emigrant.
Clerical.	Commutation.	Excursion.
Emigrant.	Mileage.	Commutation.
Excursion.	Extra fare.	Extra fare.
Excursion special.	Penna. R. R. Parlor car.	Accommodation.
Excursion employees'.	N. Y. & L. B. R. R. parlor car.	
Excursion summer.		

INTER-ROADS.—AS APPLICABLE TO TRAFFIC ORIGINATING ON ANOTHER LINE AND DESTINED TO POINTS ON A CERTAIN LINE.

	1893.	1872.	
	First-class. Special. Special time. Special time second-class. Clerical. Emigrant. Excursion. Excursion special. Commutation. Extra fare.	First-class. Special. Emigrant. Excursion. Excursion special. Extra fare. Second-class. Accommodation.	

MISCELLANEOUS.—COVERING TICKETS USED FOR ARTICLES CARRIED IN BAGGAGE CARS, AND FOR PASSING TEAMS AND PASSENGERS OVER FERRIES AND BRIDGES.

1893.	1893.—Continued.	1872.
Mall wagons. Express wagons. Extra baggage, local. Extra baggage, inter-road. Milk, local. Milk, inter-road. Milk, conductors'. Cream, local. Cream, inter-road. Marketing, local.	Marketing, conductors'. Bridge. Package stamps, local. Package stamps, inter-road. Package. Ferry, passengers. Ferry, teams.	Mall wagons. Express wagons. Extra baggage, local. Extra baggage, inter-road. Extra baggage, emigrant. Milk, local. Marketing, local. Ferry collection. Incidental. Bridge tolls.

The summary of the various forms of tickets for the years named shows as follows:—

	1893.	1872.
One-way,	39	24
Excursion,	23	9
Commutation,	35	18
	97	51

The basis of the plan now in use on the Pennsylvania Railroad system, under which the earnings of the several trains are computed, is the conductors' trip report of the tickets honored, of which the following is a sample:—

PENNSYLVANIA RAILROAD COMPANY.

Statement of the Mileage for all Passenger Business of Trains Reported at Ticket Receiver's Office, at Philadelphia, for the.....day of.....189 .

.....Ticket Receiver.

Train.	From	To	Passengers.	Mileage.			Cash.	Remarks.
				Local.	Foreign Inter-Road.	Foreign Roads. Inter-Roads.		
3	New York	Philadelphia						
5	"	"						
7	"	"						
9	"	"						
21	"	"						
23	"	"						
25	"	"						
27	"	"						
35	"	"						
41	"	"						
43	"	"						
45	"	"						
47	"	"						
49	"	"						
51	"	"						
55	"	"						
57	"	"						
59	"	"						
63	"	"						
65	"	"						
71	"	"						
73	"	"						
75	"	"						
79	"	"						
81	"	"						
83	"	"						
85	"	"						
89	"	"						
91	"	"						
93	"	"						

The ticket mileage comprised in the Ticket Receiver's statement is utilized in the general office in the preparation of the weekly estimate of passenger earnings, and, as the number of passengers, cash and ticket mileage for each train are also shown separately, it is then used in the compilation of the monthly statement of train earnings, on form following:—

PENNSYLVANIA RAILROAD COMPANY.

Statement of the Number of Passengers Carried, and Earnings Therefrom, on Through Trains from New York to Philadelphia, for the month of.....189 .

Train.	From	To	Trips.	Passen- gers.	Earn- ings.	Average Earnings.	
						Per Trip.	Per Mile Run.
3	New York.	Philadelphia.					
5	"	"					
7	"	"					
9	"	"					
21	"	"					
23	"	"					
25	"	"					
27	"	"					
35	"	"					
41	"	"					
43	"	"					
45	"	"					
47	"	"					
49	"	"					
51	"	"					
55	"	"					
57	"	"					
59	"	"					
63	"	"					
65	"	"					
71	"	"					
73	"	"					
75	"	"					
79	"	"					
81	"	"					
83	"	"					
85	"	"					
89	"	"					
91	"	"					
93	"	"					

The number of conductors' trip reports, of tickets honored, made during the month of July, 1893, was 52,500, covering the running on the several divisions of about 2850 trains, carrying 5,935,400 passengers, with earnings of \$2,323,450, while the number of ticket receivers' consolidated statements received during the month, and which must be handled in the general office in the compilation of the weekly estimate and train-earning statements, amounted to 584, or, say, twenty-three each working day.

Through the operation of this system the accounting department is enabled to promptly lay before the transportation officers and others interested monthly statements, showing the number of passengers carried, and the total earnings and average earnings per trip and per mile run for each and every train on which passenger business was moved. The method followed in the general office in the preparation of the train-earning data is to transfer to specially prepared sheets the daily business of the several trains as exhibited by the statements from the respective ticket receivers, and at the end of the month totals are made for each train of the passengers, ticket mileage, and cash collections. To the ticket mileage is then applied the average rate per mile which the actual business for the preceding month shows to have been received from passenger traffic. To the data thus obtained is added the number of passengers and amount of earnings from such of the card commutation ticket travel as is not shown on the reports rendered by conductors running on lines in certain populous districts, by reason of the impossibility of obtaining the necessary record on such trains, and which is consequently not included in the ticket receivers' statements. This commutation travel is apportioned to the several trains on the basis of percentage, arrived at by special records, taken from time to time, of the actual amount of this travel carried on the respective trains, which percentages are applied monthly to the sales as shown by agents' reports. After the total earnings for the month have been arrived at, computations are made of the averages per trip and per mile run, and the information is then transferred to the final sheets for distribution to the officers interested.

The utility of the train-earnings statement as a means of information is beyond question. The comprehensive and accurate data it conveys is of signal service to the transportation officers in many respects, notably in connection with the arrangement of train service and the distribution of the car supply. It is likewise of great value as a means of com-

parison, extending from month to month or year to year, that will infallibly indicate — by the increase or decrease of the travel in given territories or on established lines — the portions of road requiring attention and fostering care, and will show as well the results of any measures that may have been taken for the promotion of the passenger traffic. In accordance with modern ideas it is considered absolutely necessary that the managers of railroads be kept informed, at frequent periods, as to the business actually being done on their lines. The means by which this is accomplished on the Pennsylvania Railroad system is the weekly estimate. Under the present system of train earnings the passenger data necessary in connection with the estimate are easily and expeditiously collected from the ticket receivers' daily statements, on which is exhibited in consolidated form the information shown on the conductors' reports of the travel on the respective trains.

It has been my experience that the making of ticket-mileage reports by conductors has been of decided advantage to them and benefit to the service. The handling of tickets, necessary in arranging them for entry on the reports, tends to keep the conductors familiar with their appearance and privileges, and serves also as a means of education of such of their crew as may be called upon to assist in the making of these reports; also, the entry and extending of the mileage familiarize the conductors with the distance between stations on their runs, knowledge of which is of great value to them in connection with the honoring of mileage tickets. Numerous other advantages are connected with the train reports, such as, for instance, tracing tickets, determining the class of travel on the several portions of road, keeping conductors in touch with ticket receivers, and through them with the accounting and passenger departments, etc.

Since the value of the train-earning system has been proved by the experience of the Pennsylvania Railroad Company, its example has been followed by other lines, and the same

plan adopted thereon, either in its entirety or in a modified form.

In conclusion, it may be proper for me to state that, while the above system is of great value and importance to a railroad like the Pennsylvania, whose passenger service on its lines east of Pittsburg covers annually over 618,000 trips of trains, carrying 64,000,000 passengers, with a gross revenue from same of \$24,000,000, and whose equivalent of passengers carried one mile was, in 1892, 1,168,750,000, the expense involved in establishing ticket receivers' offices and train reporting would be too great for many roads, and only justifiable in such as have a large passenger business. Two conditions seem necessary to obtain satisfactory results for the expense involved:—

First. The railroad's passenger business must be of sufficient volume for the estimate of its train earnings to become a factor in the adding or withdrawal of passenger trains.

Second. That the information be also used for estimating current earnings weekly or oftener in advance of final audit of earnings from passengers.

COMPARABILITY OF TRADE STATISTICS OF VARIOUS COUNTRIES.

BY A. E. BATEMAN, C.M.G.

This is the fourth occasion on which the subject of comparative statistics of international trade has engaged the attention of the International Statistical Institute, but I regret to say that we have not yet arrived at complete accord.

It will be remembered that the chief points to which the attention of your committee has been directed are the following: (1) The valuation of imports and exports; (2) the registration of the origin of imports and of the destination of exports; (3) the classification of the articles of import and export.

As to (1) there has been little difference of opinion. The system in force in the United Kingdom for many years of valuing both imports and exports according to the declarations of importers and exporters has been approved, chiefly because it is the only possible way of showing the monthly imports and exports at the values of the month to which they relate. The approval of the committee has, however, been mainly platonic, for, so far as I know, no government have substituted the English system for their own method of periodical valuation by commissions of experts.

In approving the English system of valuation by importers' and exporters' declaration, the committee expressed their desire that some international agreement should regulate this system, and the necessary check which should be exercised over it by officials' examination of the values.

As regards the basis of valuation most European countries adopt the practice of valuing imports as they lie in the port of arrival, *i. e.*, including cost of freight; and exports at their value at the port of export, *i. e.*, excluding cost of freight. The United States, however, present an exception to this practice as regards imports, which are valued according to

the invoice values declared by the importers at the port of shipment, *i. e.*, excluding the cost of freight.

In my report to the Institute, at their Vienna meeting, I referred at some length to an endeavor which was being made by the British Government to secure uniformity of practice in the trade statistics of the various portions of the British Empire. I showed that, as regards valuation of goods, the practice of nearly half the British Colonies was defective in that only the value at the port whence the goods were shipped was shown for the imports.

This practice in many of the Colonies was closely bound up with the payment of customs duties which were mainly *ad valorem*, based on the invoice values of the goods imported. An attempt is being made to correct these values for statistical purposes by an addition of, or allowance for, the cost of freight, and I would ask the committee to make this suggestion with regard to the United States imports, so as to make their statistics more comparable with those of European countries.

The United States department has lately set a good example to other compilers of trade statistics in endeavoring to secure the proper conversion into gold values of free imports from countries where the currency is depreciated.

Turning to the second point, the origin and destination of imports and exports, it may be observed that the Institute have passed somewhat contradictory resolutions. At their meeting in Paris in 1889 they recognized the serious difficulty of showing the prime origin and ultimate destination of goods, and did not even assert that this information was desirable, while at Vienna the necessity of recording these particulars as fully as possible was distinctly affirmed by resolution. The British Government in their recommendations to the Colonies have adopted a middle course. While recognizing that the port or place from which goods have been last carried may have been only a depot for them, they admit that it is not possible, and would, even if possible, often be misleading to

record the original country where the goods were produced, but they recommend the registration of the country where the goods were purchased, and consequently from which an invoice or through bill of lading would usually be available.

In the United Kingdom Trade Accounts the registration of imports and exports has long been made according to the ship's voyage, with certain exceptions, as there can be more certainty in recording the port at which the goods were put on board than in tracing the first place where the goods originated, or their place of ultimate consumption.

Coming now to the third point, viz., the classification of the articles of import and export, it will be remembered that the committee at our last meeting at Vienna were only partially satisfied with the classification which the British Government proposed to adopt for the abstract figures of trade in the various parts of the empire. This classification attempted to settle the vexed question of distinguishing between raw materials and manufactures by treating all half made materials imported for further manufacture as raw materials, while similar articles, such as yarns, pig-iron, etc., produced in the country, were treated as *manufactures* on exportation, because they had employed industrial effort in the country.

The resolution which was adopted by the committee, while recognizing the value of this distinction for industrial purposes, affirmed that it was incomplete for the purpose of international comparison, and we are therefore again called upon to consider the question.

It must be admitted, to begin with, that all classifications are more or less faulty and misleading. For instance, Dr. Von Mayr, who took a very active and intelligent part in the discussion at Vienna, proposed to distinguish as goods manufactured those on which no more labor need be bestowed to fit them for consumption. Such a definition would exclude all textiles destined to be made up into clothing. Dr. Von Mayr made also a pertinent criticism on the class "articles

of food and drink," viz., that many articles, such as beer and spirits and sugar, were included in this heading though they ought to be included under manufactures. Live animals are usually included under articles of food and drink, although even in the case of an animal for food, such as an ox, there is a large proportion of the animal which is not for food at all, being eventually leather or tallow or bone, etc.

Notwithstanding these and many other unavoidable faults in any system, so much pressure is put upon statisticians to classify imports and exports, and to attempt to distinguish materials from manufactures, that most countries now endeavor to show at least the totals of their trade under various headings, and I have appended to this report some tables chiefly extracted from the "Statistical Abstract Relating to Foreign Countries," which give the totals and percentages for a series of years for the chief countries of Europe, and for the United States as regards their special trade.

Russia has four classes: (1) articles of food, including drink and tobacco, which form 20 per cent of her total imports and nearly 60 per cent of the exports; (2) raw and semi-manufactured materials, a large class, which includes about 60 per cent of the total imports and 35 per cent of total exports. Class (3), animals, living, is hardly entitled to be a separate class, representing less than one-half per cent of imports, and only 2 per cent of the exports. Class (4), manufactured articles, has 21 per cent of the imports, but only $4\frac{1}{2}$ per cent of the exports.

The steady decline in the imports and increase in the exports during the last 12 years will be noticed, but the discussion of these changes would travel beyond the scope of this report.

Coming to Germany only three classes are shown. Class (1) consists of food and live animals, which together had 36 per cent of the imports, and 14 per cent of the exports. Since 1880 the imports have increased and the exports decreased considerably, showing the larger dependence of

Germany on foreign food supplies. Class (2), raw materials, shows 42 per cent of the total imports and 22 per cent of the exports. Class (3), manufactured articles, includes various debatable items, such as prepared hides and yarns, and comprises 22 per cent of the imports and as much as 64½ per cent of the exports, the movements having since 1880 been the reverse of those in the food class, namely, a decrease in the percentage of the imports and an increase in the exports, showing great industrial activity.

As regards France, the classification is, like that of Germany, one of three classes, food, raw materials, and manufactures. Horses are, however, classed as raw material instead of under articles of food and live animals, as in Germany.

Class (1) has 35 per cent of the imports and 23 per cent of the exports. Class (2), raw materials, comprises 51 per cent of the imports and 23 per cent of the exports. Class (3), manufactured articles, including, as in the case of Germany, many half-made goods, has 15 per cent of the imports and 54 per cent of the exports.

Turning next to Switzerland there are the three classes of food, raw materials, and manufactured articles. Horses and draught animals generally are among raw materials, and raw tobacco also, while manufactured tobacco is among manufactured articles instead of being classed among food. The imports are divided almost exactly between the three classes, the exports being in articles of food, to the amount of 12 per cent, raw materials also 12 per cent, and the remainder in manufactured articles, 76 per cent, which is a very large proportion.

Turning next to Italy we find four classes of articles, namely: (1) articles of food, (2) raw materials used in industry, (3) worked-up materials used in industry, and (4) manufactured articles. In class (1) the percentage of imports has increased from 20 per cent to 24 per cent, while the exports have declined from 37 per cent to 29 per cent.

Raw materials have increased in imports from 30 per cent to 36 per cent, and in exports from 17 per cent to 20 per cent, while worked-up materials are slightly less in the imports, and in the exports are more, namely, $35\frac{1}{2}$ per cent instead of $31\frac{1}{2}$ per cent in 1881. Manufactured articles show a large decrease in the proportion under imports, viz., from 32 per cent to 24 per cent, with an increase in the exports, which were 16 per cent in 1890 compared with 14 per cent in 1881.

It has not been possible to enumerate the chief articles in the various classes in Italy, so the treatment of such doubtful articles as horses, tobacco, and seeds cannot be stated.

Taking Austria next we find three divisions: (1) articles of food (raw and unprepared); (2) raw materials; and (3) manufactured articles. It will be noticed that manufactured food and tobacco are included among manufactured articles and not among food, and that yarns are also counted as manufactures. These differences of classification will therefore affect the percentages. Raw food imports have declined from 22 per cent of the total to $15\frac{1}{2}$ per cent, while exports have slightly increased from 21 per cent to nearly 23 per cent. Raw materials imported are 39 per cent instead of $30\frac{1}{2}$ per cent, and their exports 27 per cent instead of 24 per cent. The large class of manufactured articles has slightly declined in the imports, being in 1890 nearly 46 per cent, while the exports show a larger decrease, viz., from 55 per cent of the total exports to less than 50 per cent.

We now come to the United States, where we find a totally distinct classification from any of the European ones, and it is further complicated by the import classes differing entirely from those used in the export accounts.

As regards imports there are five classes, namely: (1) articles of food and live animals; (2) articles in a crude condition for use in domestic industry; (3) articles wholly or partially manufactured for use as materials; (4) manufactured articles ready for consumption; and (5) articles of voluntary use, luxuries, etc. This last class includes manu-

factured tobacco, beer, spirits, and wine, and, among textiles, articles of lace, embroidery, or insertion, which are all considered to bear the stamp of luxury. The distinction is, however, one of much difficulty. The proportion of class (1), food and live animals, to the total imports is now nearly 37 per cent, compared with 30½ per cent in 1883, and class (2), crude materials, has also increased, while articles partially or wholly manufactured both for use or consumption have decreased, as also have so-called luxuries, since the passing of the McKinley Act.

As regards the exports, there are six classes, namely: (1) products of agriculture; (2) products of mines; (3) products of the forest; (4) products of the fisheries; (5) products miscellaneous; all these categories consisting of merchandise other than manufactures; and (6) domestic manufactures. Of these, class (1) represents nearly 79 per cent of the total exports, and class (6), domestic manufactures, nearly 16 per cent, leaving only five per cent for the remaining four classes.

It will be remembered that bullion and specie are excluded from all these classifications that we have been considering; an omission of considerable importance as regards the United States.

Having now briefly considered the various classifications of the principal foreign countries I will again refer to the new classification which the British Government have recommended for adoption in the various parts of the British Empire. Up to the present time British India and most of the Crown Colonies have adopted the proposed classification. The Dominion of Canada and the Australasian Colonies have not yet come to a decision, but the former already possesses a classification somewhat akin to that of the United States.

For British India I append a statement of the imports and exports in 1891 and 1892, compiled according to the prescribed system. In 1892, Class (1), live animals, food

and drink, and narcotics, has 11 per cent of the imports and 40 per cent of the exports. Class (2), raw materials, has 10 per cent of the imports and 33 per cent of the exports. Class (3), manufactured articles, has nearly 60 per cent of the imports and 20 per cent of the exports, while the remaining class, bullion and specie, a class which is omitted in the foreign classification which we have been considering, has 20 per cent of the imports and nearly 7 per cent of the exports.

Lastly, I append a statement of the same classification applied to the imports and exports of the United Kingdom in 1892. Here class (1), live animals, food and drink, and narcotics, amounts to 42 per cent of the general imports and to only 7 per cent of the general exports. Class (2), raw materials, has $38\frac{1}{2}$ per cent of the imports and 21 per cent of the exports. Class (3), manufactured articles, has 12 per cent of the imports and 63 per cent of the exports, and the new class of coin and bullion has 7 per cent and 9 per cent, respectively. It will be noticed that both general and special exports are given, and there are considerable differences in the percentages according as one or the other is taken, arising mainly from the large re-export trade of the United Kingdom in food and raw materials. Exports of British manufactures represent no less than 76 per cent of British exports, the exact figure recorded in Switzerland under the same class. The new method of classing half wrought materials among raw materials, when imported, also affects the figures. In the classification which has hitherto been used in the Monthly Accounts of United Kingdom, imported manufactures amounted to 65 millions sterling in 1892, while under the new system the omission of various half-manufactured articles, such as leather, yarns, etc., reduces this amount to $56\frac{1}{2}$ millions.

Having now concluded my survey of the various classifications, I would point out that even in their present divergent forms they present most interesting material for examining the industrial and commercial capacities of the various coun-

tries. I have carefully abstained from commenting on the causes of the results shown by these figures as being a matter outside the scope of the committee, but it will be evident that in combination with statistics, which are every year becoming more reliable, of agricultural and industrial production in the different countries, these trade figures, under an assimilated classification and system of valuation, will add immensely to our knowledge of the resources and intercourse of the various portions of the civilized world.

I. RUSSIAN EMPIRE.

VALUE OF IMPORTS AND EXPORTS (*Special Trade*) INTO AND FROM THE RUSSIAN EMPIRE, DISTINGUISHING ARTICLES OF FOOD, RAW AND SEMI-MANUFACTURED MATERIALS, ANIMALS, AND MANUFACTURED ARTICLES IN EACH YEAR FROM 1880 TO 1891, INCLUSIVE.

	Years.	IMPORTS.		EXPORTS.	
		Value.	Per Cent of Total Value.	Value.	Per Cent of Total Value.
		1,000 Credit Roubles.	Per Cent.	1,000 Credit Roubles.	Per Cent.
ARTICLES OF FOOD :	1880	167,909	27.0	247,886	49.7
	1881	124,633	24.1	261,015	51.6
	1882	147,769	26.1	350,631	56.7
	1883	150,869	26.8	384,685	60.1
	1884	159,212	29.7	347,877	59.0
	1885	117,400	27.0	334,552	62.1
	1886	120,863	28.3	274,702	56.3
	1887	90,633	22.7	373,287	59.9
	1888	78,186	20.2	502,312	63.3
	1889	82,948	19.2	432,581	56.5
	1890	81,764	20.1	393,610	55.8
	1891	77,736	20.9	423,637	58.7
RAW AND SEMI-MANUFACTURED MATERIALS :	1880	289,705	46.5	223,024	44.7
	1881	278,458	53.8	219,457	43.3
	1882	288,265	50.9	232,232	37.6
	1883	297,132	52.9	222,717	34.8
	1884	272,172	50.7	212,478	36.0
	1885	253,367	53.6	172,586	32.1
	1886	226,640	53.2	180,957	37.0
	1887	242,660	60.7	213,686	34.3
	1888	238,858	61.9	246,840	31.1
	1889	265,645	61.5	288,132	37.6
	1890	245,487	60.4	272,358	38.6
	1891	214,089	57.6	248,414	34.4
ANIMALS, LIVING : *	1880	1,040	.2	16,002	3.2
	1881	1,021	.2	12,706	2.5
	1882	917	.2	19,110	3.1
	1883	1,242	.2	16,482	2.6
	1884	1,056	.2	14,236	2.4
	1885	1,488	.3	14,643	2.7
	1886	1,321	.3	11,767	2.4
	1887	1,185	.3	12,500	2.0
	1888	1,539	.4	13,438	1.7
	1889	1,497	.3	13,269	1.7
	1890	1,689	.4	11,161	1.6
	1891	1,607	.4	16,720	2.3
MANUFACTURED ARTICLES : †	1880	164,158	26.3	11,760	2.4
	1881	113,601	21.9	13,245	2.6
	1882	129,841	23.0	15,823	2.6
	1883	112,999	20.1	16,411	2.5
	1884	104,494	19.4	15,310	2.6
	1885	83,073	19.1	16,871	3.1
	1886	77,687	18.2	21,077	4.3
	1887	65,149	16.3	23,479	3.8
	1888	67,559	17.5	31,274	3.9
	1889	81,881	19.0	32,020	4.2
	1890	77,710	19.1	27,968	4.0
	1891	78,088	21.0	32,166	4.5
TOTAL	1880	622,812	....	488,672	....
	1881	517,713	....	506,423	....
	1882	566,792	....	617,796	....
	1883	562,232	....	640,295	....
	1884	536,936	....	589,901	....
	1885	435,388	....	538,652	....
	1886	426,511	....	488,483	....
	1887	399,627	....	622,952	....
	1888	386,142	....	793,864	....
	1889	431,971	....	766,002	....
	1890	406,650	....	705,097	....
	1891	371,584†	....	721,613‡	....

* Includes also some dead game. † Except certain manufactures which are included under the category of Articles of Food. ‡ Including imports of the value of 64,000 Roubles, not separately distinguished in any of the respective categories. § Including exports of the value of 676,000 Roubles, not separately distinguished in any of the respective categories.

II. GERMANY.

VALUE OF IMPORTS AND EXPORTS (*Special Trade*) INTO AND FROM GERMANY DISTINGUISHING ARTICLES OF FOOD, RAW MATERIALS, AND MANUFACTURED ARTICLES IN EACH YEAR FROM 1880 TO 1891, INCLUSIVE.

	Years.	IMPORTS.		EXPORTS.	
		Value.	Per Cent of Total Value.	Value.	Per Cent of Total Value.
		Millions of Marks.	Per Cent.	Millions of Marks.	Per Cent.
ARTICLES OF FOOD AND LIVE ANIMALS :	1880	920	32.6	641	22.1
	1881	982	33.1	591	19.8
	1882	1,049	33.5	664	20.8
(Includes Horses, Cattle, Sheep, Swine, Goats, Live Fowl, Animal and Farina- ceous Substances Raw and Manufactured ; Fruits, Vegetables, Spices, Salt, Ice, Colonial Wares, Fermented and Distilled Beverages, Confectionery, Tobacco Raw or Manufactured, etc.)	1883	1,060	32.5	688	21.0
	1884	1,044	32.0	614	19.2
	1885	893	30.3	528	18.5
	1886	846	29.3	486	16.3
	1887	967	30.9	500	15.9
	1888	907	27.6	486	15.2
	1889	1,229	30.6	401	12.7
	1890	1,397	33.5	471	14.2
	1891	1,513	36.3	439	13.8
RAW MATERIALS : *	1880	1,118	39.6	584	20.2
(Includes Seeds and Herbs for Sowing, also Fodder, Waste Substances, Manures, Combustibles, Crude Oils and Chemicals, Earths, Stones, Ores, Metals, Timber, Pulp, Raw Hides and Skins, Hair, Feathers, Raw Textile Materials (un-spun), Caoutchouc and Gutta-percha Raw or Cleaned, etc.)	1881	1,150	38.8	633	21.3
	1882	1,211	38.7	643	20.2
	1883	1,282	39.3	623	19.0
	1884	1,300	39.9	578	18.0
	1885	1,211	41.2	532	18.6
	1886	1,193	41.3	555	18.6
	1887	1,325	42.4	586	18.7
	1888	1,507	45.8	646	20.1
	1889	1,793	44.6	667	21.0
	1890	1,784	42.9	710	21.3
	1891	1,753	42.0	688	21.7
MANUFACTURED ARTICLES : †	1880	783	27.8	1,670	57.7
(Includes Manufactured Oils, Chemicals, Earthen Ware, Porcelain, Glass, and Metals, Wood Carvings, Paper and Manufactures thereof, Prepared Hides, Leather, Yarns, Textile Goods, Hosiery, Railway Rolling Stock, Machinery and Instruments, Small Wares, Literary and Artistic Objects, Wearing Apparel, etc.)	1881	831	28.1	1,753	58.9
	1882	869	27.8	1,883	59.0
	1883	922	28.2	1,963	60.0
	1884	917	28.1	2,013	62.8
	1885	840	28.5	1,800	62.9
	1886	849	29.4	1,945	65.1
	1887	833	26.7	2,049	65.4
	1888	877	26.6	2,074	64.7
	1889	993	24.8	2,099	66.3
	1890	981	23.6	2,147	64.5
	1891	904	21.7	2,049	64.5
TOTAL	1880	2,821	....	2,895	....
	1881	2,963	....	2,977	....
	1882	3,129	....	3,190	....
	1883	3,264	....	3,272	....
	1884	3,261	....	3,205	....
	1885	2,944	....	2,860	....
	1886	2,888	....	2,986	....
	1887	3,125	....	3,135	....
	1888	3,291	....	3,206	....
	1889	4,015	....	3,167	....
	1890	4,162	....	3,328	....
	1891	4,170	....	3,176	....

* Including certain semi-manufactured articles for use in the Iron and Timber Trades.

† Except certain Manufactures which are included under the category of Articles of Food.

III. FRANCE.

VALUE OF IMPORTS AND EXPORTS (*Special Trade*) INTO AND FROM FRANCE, DISTINGUISHING ARTICLES OF FOOD, RAW MATERIALS, AND MANUFACTURED ARTICLES IN EACH YEAR FROM 1880 TO 1891, INCLUSIVE.

	Years.	IMPORTS.		EXPORTS.	
		Value.	Per Cent of Total Value.	Value.	Per Cent of Total Value.
		1,000 Francs.	Per Cent.	1,000 Francs.	Per Cent.
ARTICLES OF FOOD :	1880	2,017,300	40.1	834,900	24.1
	1881	1,742,600	35.8	887,300	24.9
	1882	1,670,700	34.6	878,800	24.6
(Includes Cereals, Coffee,	1883	1,638,200	34.1	849,400	24.6
Fruit, Cattle, Meat, Fish,	1884	1,438,400	33.1	783,400	24.2
Fats, Cheese, Butter, Sugar,	1885	1,455,300	35.6	749,800	24.3
Rice, Vegetables, Cocon,	1886	1,540,700	36.6	731,200	22.5
Olive Oil, Wine, Spirits,	1887	1,423,000	35.4	703,000	21.7
and all Distilled and Fer-	1888	1,507,000	36.7	726,700	22.4
mented Beverages, Eggs,	1889	1,441,200	33.4	837,500	22.6
Potatoes, Dried Vegetables,	1890	1,445,100	32.6	855,400	22.8
etc.)	1891	1,652,500	34.7	808,800	22.7
RAW MATERIALS :	1880	2,416,700	48.0	793,100	22.9
	1881	2,437,300	50.1	800,100	22.5
(Includes Raw Wool, Coal,	1882	2,375,000	49.3	807,300	22.6
Silk, Hides, Raw Cotton,	1883	2,397,700	49.9	751,600	21.8
Seeds, Wood, Flax, Miner-	1884	2,208,400	50.9	759,100	23.5
als, Copper, Petroleum,	1885	2,022,400	49.5	707,400	22.9
Seed Oils, Lead, Jute, To-	1886	2,082,400	49.5	773,000	23.8
bacco in the leaf, Manures,	1887	2,014,400	50.0	806,000	24.8
Indigo, Horses, Zinc, Tin,	1888	2,021,200	49.2	813,400	25.0
Hemp, Hops, Sulphur, Saf-	1889	2,262,500	52.4	940,600	25.4
ron and Steel, Rags, Build-	1890	2,341,700	52.8	899,000	23.9
ers' Materials, etc.) . . .	1891	2,419,400	50.7	834,700	23.4
MANUFACTURED ARTICLES :*					
(Includes Manufactures of	1880	596,200	11.9	1,839,900	53.0
Wool, Silk, Cotton, Hemp,	1881	683,500	14.1	1,874,100	52.6
and Flax, Yarns of Cotton,	1882	775,100	16.1	1,888,300	52.8
Wool, Flax, and Hemp,	1883	768,400	16.0	1,850,900	53.6
Machinery, Metal Wares,	1884	696,700	16.0	1,690,000	52.3
Arms, Nitrate of Soda, Soap,	1885	610,300	14.9	1,630,900	52.8
Skins prepared, Paper of	1886	585,000	13.9	1,744,600	53.7
all sorts, Jewelry, Straw-	1887	588,600	14.6	1,738,500	53.5
plait, Leather Wares, Clocks,	1888	578,800	14.1	1,706,600	52.6
Tobacco prepared, Small	1889	613,100	14.2	1,925,900	52.0
Fancy Wares, Metal Wares,	1890	650,100	14.6	1,999,000	53.3
Ready-made Clothing, Glass	1891	695,900	14.6	1,926,200	53.9
Ware and Earthen Ware,					
Chemical and Pharmaceu-					
tical Products, Millinery,					
etc.)	1880	5,033,200	....	3,467,900	....
	1881	4,863,400	....	3,561,500	....
	1882	4,821,800	....	3,574,400	....
	1883	4,804,300	....	3,451,900	....
	1884	4,343,500	....	3,232,500	....
	1885	4,088,400	....	3,088,100	....
	1886	4,208,100	....	3,248,800	....
	1887	4,026,000	....	3,246,500	....
	1888	4,107,000	....	3,246,700	....
	1889	4,316,800	....	3,704,000	....
	1890	4,436,900	....	3,753,400	....
	1891	4,767,800	....	3,569,700	....
TOTAL					

* Except certain manufactures which are included under the category of Articles of Food.

IV. SWITZERLAND.

VALUE OF IMPORTS AND EXPORTS (*Special Trade*) INTO AND FROM SWITZERLAND,
DISTINGUISHING ARTICLES OF FOOD, RAW MATERIALS, AND MANUFACTURED
ARTICLES IN EACH YEAR FROM 1885 TO 1891, INCLUSIVE.

	Years.	IMPORTS.		EXPORTS.	
		Value.	Per Cent of Total Value.	Value.	Per Cent of Total Value.
		1,000 <i>Francs.</i>	<i>Per Cent.</i>	1,000 <i>Francs.</i>	<i>Per Cent.</i>
ARTICLES OF FOOD :	1885	208,968	29.1	79,242	11.8
(Includes Chemicals and Drugs to be used as food, Agricultural and Animal Products, Animals not else- where mentioned, Food Products, Wine, Spirits, and all Fermented and Distilled Beverages, etc.)	1886	225,783	29.1	82,703	12.4
	1887	238,152	28.9	77,019	11.5
	1888	237,995	29.0	72,983	10.8
	1889	262,168	29.0	73,217	10.5
	1890	295,805	31.0	78,822	11.2
	1891	304,159	32.6	80,000	11.9
RAW MATERIALS :					
(Includes Chemicals and Drugs in a crude state, Dye Stuffs crude, Straw, Ma- nures crude, Wood un- wrought, Animals such as Horses, also Farm and Draught Animals, Iron, Lead, Copper, Tin, Zinc, and other Metals, Tobacco in the leaf, Raw Cotton, Hemp, Flax, Raw Silk, Ani- mal Products for Manufac- ture, etc.)	1885*	263,009	36.7	113,481	17.0
	1886*	292,419	37.7	101,409	15.1
	1887*	317,406	38.6	98,055	14.6
	1888*	308,110	37.5	104,651	15.6
	1889	350,489	38.7	94,363	13.6
	1890	354,792	37.2	85,782	12.2
	1891	322,281	34.6	80,433	12.0
MANUFACTURED ARTICLES :†					
(Includes Chemicals and Drugs made up, Dye Stuffs manufactured, Glass Wares, Manures, Paper, Wood wrought, Leather Wares, Works of Literature and Art, Earthen Ware, Clocks and Watches, Machines and Machinery, Manufactured articles of Iron, Lead, Cop- per, Tin, Zinc, etc., Manu- factured Tobacco,—Cigars, —Manufactures of Cotton, Linen, Silk, Wool, Gutta- percha, Straw, Ready-made Clothing, Animal Products manufactured, etc.)	1885*	245,126	34.2	477,017	71.2
	1886*	257,738	33.2	484,899	72.5
	1887*	267,847	32.5	497,048	73.9
	1888*	275,288	33.5	496,038	73.6
	1889	292,030	32.3	527,943	75.9
	1890	303,676	31.8	538,209	76.6
	1891	305,951	32.8	511,434	76.1
	1885*	717,103	....	669,740	....
	1886*	775,940	....	669,011	....
	1887*	823,405	....	672,122	....
TOTAL	1888*	821,393	....	673,672	....
	1889	904,687	...	695,523	....
	1890	954,273	....	702,813	....
	1891	932,391	....	671,867	....

* Including Bullion and Specie in the years 1885 to 1888 inclusive.

† Except certain manufactures which are included under the category of Articles of Food.

V. ITALY.

VALUE OF IMPORTS AND EXPORTS (*Special Trade*) INTO AND FROM ITALY, DISTINGUISHING ARTICLES OF FOOD, MATERIALS USED IN INDUSTRY, RAW AND WORKED-UP, AND MANUFACTURED ARTICLES IN EACH YEAR FROM 1881 TO 1890, INCLUSIVE.

	Years.	IMPORTS.		EXPORTS.	
		Value.	Per Cent of Total Value.	Value.	Per Cent of Total Value.
		1,000 Lire.	Per Cent.	1,000 Lire.	Per Cent.
ARTICLES OF FOOD.	1881	206,139	19.9	366,729	37.5
	1882	206,197	19.5	389,513	40.1
	1883	237,752	20.6	442,941	42.0
	1884	262,322	20.9	387,838	39.0
	1885	409,976	27.9	311,341	33.9
	1886	384,244	25.9	361,381	36.2
	1887	420,083	25.0	415,830	40.3
	1888	274,392	22.7	292,318	30.8
	1889	364,017	26.0	278,915	28.9
	1890	318,811	24.2	265,229	29.1
MATERIALS USED IN INDUSTRY: RAW.	1881	311,084	30.2	163,858	17.2
	1882	327,556	31.1	159,094	16.4
	1883	331,576	28.8	185,179	17.5
	1884	360,746	28.7	176,330	17.7
	1885	394,490	26.8	166,689	18.2
	1886	411,283	27.8	171,849	17.2
	1887	474,027	28.2	159,532	15.5
	1888	398,830	32.9	175,979	18.5
	1889	456,774	32.6	180,225	18.7
	1890	468,624	35.6	171,411	19.6
MATERIALS USED IN INDUSTRY: WORKED-UP.	1881	181,838	17.6	300,439	31.6
	1882	172,062	16.3	287,965	29.6
	1883	197,383	17.1	296,617	28.0
	1884	213,964	17.1	289,579	29.2
	1885	212,680	14.5	291,084	31.7
	1886	232,743	15.7	323,788	32.4
	1887	247,803	14.8	310,105	30.1
	1888	188,932	15.6	348,067	36.7
	1889	220,137	15.7	356,005	36.9
	1890	210,533	16.0	311,321	35.5
MANUFACTURED ARTICLES.	1881	333,759	32.3	130,718	13.7
	1882	349,530	33.1	135,268	13.9
	1883	385,286	33.5	131,649	12.5
	1884	418,440	33.3	139,758	14.1
	1885	462,455	30.8	148,820	16.2
	1886	452,665	30.6	141,962	14.2
	1887	537,579	32.0	146,017	14.1
	1888	348,807	28.8	133,473	14.0
	1889	360,973	35.7	149,965	15.5
	1890	318,618	24.2	137,800	15.8
TOTAL.	1881	1,031,820	....	951,744	....
	1882	1,064,345	....	971,860	....
	1883	1,151,997	....	1,066,386	....
	1884	1,255,462	....	993,505	....
	1885	1,469,601	....	917,914	....
	1886	1,480,935	....	998,980	....
	1887	1,679,492	....	1,031,484	....
	1888	1,210,241	....	949,837	....
	1889	1,401,901	....	965,110	....
	1890	1,316,586	....	875,761	....

NOTE.—The above figures do not agree with those published in the Trade Volumes for the respective years, as those here given have been calculated throughout upon the valuation fixed for 1890. It has not been found possible to enumerate the chief articles included under the various heads.

VI. AUSTRIA.

VALUE OF IMPORTS AND EXPORTS (*Special Trade*) INTO AND FROM AUSTRIA DISTINGUISHING ARTICLES OF FOOD, RAW MATERIALS, AND MANUFACTURED ARTICLES IN EACH YEAR FROM 1880 TO 1890, INCLUSIVE.

	Years.	IMPORTS.		EXPORTS.	
		Value.	Per Cent of Total Value.	Value.	Per Cent of Total Value.
		1,000 <i>Gulden.</i>	<i>Per Cent.</i>	1,000 <i>Gulden.</i>	<i>Per Cent.</i>
ARTICLES OF FOOD (RAW AND UNPREPARED): (Includes Cereals, Coffee, Rice, Spices, Colonial Produce, Tea, Tobacco, Raw, etc.)	1880	134,500	21.9	143,200	21.2
	1881	128,700	20.0	170,400	23.3
	1882	129,400	19.8	207,000	26.5
	1883	115,500	18.5	172,300	23.0
	1884	105,400	17.2	131,500	19.0
	1885	109,000	19.5	133,500	19.9
	1886	88,400	16.4	149,300	21.4
	1887	84,600	14.9	147,600	21.9
	1888	74,600	14.0	169,400	23.3
	1889	81,100	13.8	170,300	22.2
	1890	94,700	15.5	175,800	22.8
RAW MATERIALS: (Includes Cotton, Wool, Flax, Hemp and Jute, Chemical Products, etc.)	1880	187,000	30.5	161,600	23.9
	1881	202,000	31.5	168,900	23.1
	1882	205,000	31.3	174,800	22.3
	1883	213,600	34.2	176,600	23.5
	1884	207,900	33.9	176,200	25.5
	1885	189,700	34.0	170,800	25.4
	1886	200,800	37.2	167,400	23.9
	1887	220,500	38.8	166,100	24.7
	1888	206,100	38.7	186,100	25.5
	1889	226,400	38.4	206,900	27.0
	1890	236,700	38.8	211,700	27.4
MANUFACTURED ARTICLES: (Includes Yarns and Tissues, Manufactures from other Organic Substances, Manufactured Foods, Tobacco Manufactured, Chemical Products, Metals and Metal Wares, Products of minor Manufacturing Industries, Machinery, Instruments, Rolling Stock, Vessels, and other means of transport, Manufactures from Mineral Products other than Metals, etc.)	1880	292,000	47.6	371,200	54.9
	1881	311,100	48.5	392,200	53.6
	1882	319,800	48.9	400,100	51.2
	1883	295,800	47.3	401,000	53.5
	1884	299,300	48.9	383,800	55.5
	1885	259,200	46.5	367,800	54.7
	1886	250,000	46.4	381,900	54.7
	1887	263,500	46.3	359,200	53.4
	1888	252,400	47.3	373,300	51.2
	1889	281,700	47.8	389,000	50.8
	1890	279,300	45.7	383,900	49.8
TOTAL	1880	613,500	....	676,000	....
	1881	641,800	....	731,500	....
	1882	654,200	....	781,900	....
	1883	624,900	....	749,900	....
	1884	612,600	....	691,500	....
	1885	557,900	....	672,100	....
	1886	539,200	....	698,500	....
	1887	568,600	....	672,900	....
	1888	533,100	....	728,800	....
	1889	589,200	....	766,200	....
	1890	510,700	....	771,400	....

VIII. UNITED STATES.

STATEMENT SHOWING THE VALUE OF IMPORTS AND EXPORTS INTO AND FROM THE UNITED STATES, DISTINGUISHED ACCORDING TO THE UNDERMENTIONED CATEGORIES, IN EACH YEAR FROM 1883 TO 1892, INCLUSIVE.

DESCRIPTION OF CATEGORY.	IMPORTS.*									
	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.
	PER CENT OF TOTAL VALUE.									
IMPORTS OF —	30.59	33.66	33.52	31.35	30.92	30.50	32.10	31.92	33.72	36.64
Articles of Food and Live Animals.	21.29	20.75	20.64	23.31	24.30	24.07	23.96	22.91	23.27	24.67
Articles in a crude condition which enter into the various processes of Domestic Industry.	12.64	12.28	12.46	12.41	11.60	11.73	11.27	10.74	12.91	10.06
Articles wholly or partially manufactured for Use as Materials in the Manufactures and Mechanic Arts.	23.17	20.11	20.58	20.14	20.21	20.44	19.61	20.01	16.21	15.97
Manufactured Articles ready for consumption.	12.31	13.20	12.80	12.79	12.97	13.26	13.06	14.42	13.89	12.66
Articles of Voluntary Use, Luxuries, etc.										
DESCRIPTION OF CATEGORY.	EXPORTS (SPECIAL).									
	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.
	PER CENT OF TOTAL VALUE.									
EXPORTS OF —	77.00	73.98	72.96	72.82	74.41	73.23	72.87	74.51	73.69	78.69
DOMESTIC MERCHANDISE OTHER THAN MANUFACTURES:—	1.30	2.07	2.18	2.05	1.67	2.73	2.63	2.64	2.53	2.04
Products of Agriculture.	3.56	3.62	3.03	3.15	3.01	3.51	3.70	3.49	3.29	2.75
Products of the Mines. . . . .	.78	.77	.82	.77	.73	.82	.97	.88	.71	.53
Products of the Forest. . . . .	.67	.75	.76	.71	.73	.76	.74	.61	.41	.38
Products of the Fisheries.	16.69	18.81	20.25	20.50	19.45	19.05	18.99	17.87	19.37	15.61
Products, Miscellaneous.										
MANUFACTURES, DOMESTIC.										

* General Imports, except in the Years 1883, 1884, and 1885, where Imports entered for Consumption only are given.

TO THE UNDERMENT

EXPORTS (S:

	1886.	1887.	1888
VALUE.			
1,000 IMPO Dollars.	1,000 Dollars.	1,000 Dolla	
ART (U			
484,855	523,074	500,8	
72.82	74.41	73.4	
13,654	11,759	17,9	
ART TH (In			
2.05	1.67	2.4	
20,962	21,126	23,9	
3.15	3.01	3.4	
ART FM M (U			
5,139	5,156	5,5	
.77	.73	.4	
MA Q			
,713	5,173	5,2	
.71	.73	.4	
As			
42	136,735	130,34	
50	19.45	19.6	
5	703,023	683,86	

consumption only :

IX. BRITISH INDIA.

VALUE OF IMPORTS AND EXPORTS (*excluding Government transactions*) INTO AND FROM BRITISH INDIA, DISTINGUISHING ARTICLES OF FOOD, ETC., RAW MATERIALS, MANUFACTURED ARTICLES, ETC., IN THE YEARS 1891 AND 1892 (*Calendar Years*).

(*Including Bullion and Specie.*)

	IMPORTS.				EXPORTS.			
	Value.		Per Cent of Total Value.		Value.		Per Cent of Total Value.	
	1891.	1892.	1891.	1892.	1891.	1892.	1891.	1892.
	<i>Rupees.</i>	<i>Rupees.</i>	<i>Per Cent.</i>	<i>Per Cent.</i>	<i>Rupees.</i>	<i>Rupees.</i>	<i>Per Cent.</i>	<i>Per Cent.</i>
LIVE ANIMALS, FOOD AND DRINK, AND NARCOTICS :								
(a) Live Animals	3,307,388	3,034,109	.4	.4	999,809	1,316,983	.1	.1
(b) Food and Drink . . .	83,995,139	79,116,171	10.2	10.0	346,881,359	338,340,984	33.2	31.2
(c) Narcotics (Opium and Tobacco) }	1,529,139	1,804,492	.2	.2	94,715,344	97,663,431	9.1	9.0
LIVE ANIMALS, ETC. - TOTAL	88,831,666	83,954,772	10.8	10.6	442,596,512	437,321,398	42.4	40.3
RAW MATERIALS :								
(a) Textile	52,705,961*	43,261,938*	6.4	5.5	216,984,035	200,012,727	20.8	18.4
(b) Metal	9,866,462	7,664,381	1.2	1.0	129,733	85,729	.1	.1
(c) Other (including Chemicals and Drugs) . }	24,122,879	28,607,060	2.9	3.6	174,085,815	160,270,560	16.7	14.8
RAW MATERIALS - TOTAL	86,695,302	79,533,379	10.5	10.1	391,199,583	366,369,016	37.5	33.2
MANUFACTURED ARTICLES :								
(a) Textile	305,798,528	288,722,770	37.2	36.7	100,565,119*	111,628,156*	9.6	10.3
(b) Metal	47,066,385	58,443,817	5.7	7.4	622,635†	670,994†	.1	.1
(c) Other‡	144,105,441	119,730,060	17.5	15.2	84,340,862	101,115,476	8.0	9.3
MANUFACTURED ARTICLES } TOTAL	496,960,354	466,896,637	60.4	59.3	185,528,616	213,414,626	17.7	19.7
TOTAL	672,487,322	630,384,788	81.7	80.0	1,019,324,711	1,011,105,040	97.6	93.2
COIN AND BULLION :								
(a) Gold	53,259,344	14,867,339	6.5	1.9	11,607,353	49,434,493	1.1	4.5
(b) Silver	96,700,679	142,405,212	11.8	18.1	13,345,082	24,957,622	1.3	2.3
COIN AND BULLION - TOTAL	149,960,023	157,272,551	18.3	20.0	24,952,435	74,392,115	2.4	6.8
TOTAL (INCLUDING COIN AND BULLION) }	822,447,345	787,657,339	....	....	1,044,277,146	1,085,497,155	....	..

* In the case of Imports, Twist and Yarn are included under Raw Materials, but in Exports under Manufactured Articles.

† Includes Hardware and Cutlery.

‡ Includes Machinery, Railway Materials, Dyes, and Oils in the case of Imports. In the Exports, Dyes and Oils only are specially mentioned as being included.

X. UNITED KINGDOM.

VALUE OF IMPORTS AND EXPORTS INTO AND FROM THE UNITED KINGDOM, DISTINGUISHING ARTICLES OF FOOD, ETC., RAW MATERIALS, MANUFACTURED ARTICLES, ETC., IN THE YEAR 1892.

(Including Bullion and Specie.)

	IMPORTS (General).		EXPORTS (General).		EXPORTS (Special).	
	Value.	Per Cent of Total Value.	Value.	Per Cent of Total Value.	Value.	Per Cent of Total Value.
	1,000l.	Per Cent.	1,000l.	Per Cent.	1,000l.	Per Cent.
LIVE ANIMALS, FOOD, AND DRINK, AND NARCOTICS .	191,713	42.0	23,560	7.3	10,444	4.1
RAW MATERIALS :						
(a) Textile	81,198	17.8	26,604	8.3	1,783	.7
(b) Metal	21,557	4.7	4,006	1.3	333	.1
(c) Other kinds	72,799	16.0	35,638	11.1	19,111	7.5
RAW MATERIALS - TOTAL	175,554	38.5	66,248	20.7	21,227	8.3
MANUFACTURED ARTICLES :						
(a) Textile	26,025	5.7	110,860	34.6	108,238	42.3
(b) Metal	4,848	1.1	38,861	12.1	38,189	14.9
(c) Other kinds	25,654	5.6	52,111	16.3	48,979	19.1
MANUFACTURED ARTICLES } TOTAL	56,527	12.4	201,832	63.0	195,406	76.3
TOTAL	423,794	92.9	291,640	91.0	227,077	88.7
COIN AND BULLION :						
(a) Gold	21,583	4.7	14,832	4.6	14,832	5.8
(b) Silver	10,746	2.4	14,079	4.4	14,079	5.5
COIN AND BULLION - TOTAL	32,329	7.1	28,911	9.0	28,911	11.3
TOTAL (INCLUDING COIN AND BULLION)	456,123	....	320,551	....	255,988	....

Synopsis.]THE GEOGRAPHICAL DISTRIBUTION OF THE
POPULATION OF THE UNITED STATES.BY HENRY GANNETT,
OF THE UNITED STATES GEOLOGICAL SURVEY.

The original settlements within the territory now constituting the United States were made mainly along the Atlantic coast. As the people increased and multiplied they spread inland to the westward, following in the main parallels of latitude. The northwestern states have been peopled, so far as their inhabitants of native origin are concerned, from the northeastern states, and similarly the southwestern states have been peopled from the southeastern states. There has been little movement of population from north to south or the reverse.

The importation of negro slaves from the West Indies, and from Africa, began at a very early date in colonial history. The slave population was never of importance in the northern states, but in the southern states it early became a very large element, so large and so well adapted to the climatic conditions as to practically monopolize the labor of that part of the country. It constitutes now about one-eighth of the total population.

The social position which the colored element occupies in the south is in the north filled by the foreign element. Immigration from Europe to this country was never of great importance until 1847, when the famines in Ireland and political troubles in Germany produced an overflow from these countries into this. Since then immigration has continued in enormous and rapidly increasing volume, until up to the present time more than fifteen and one-half million people have crossed the Atlantic and found homes in this country. Most of these people are from northern Europe, from Ireland, Great Britain, Germany, and Scandinavia. In recent years

the Russians, Poles, Bohemians, and Italians have joined the throng in considerable numbers.

Nearly all these immigrants land in New York, and thence scatter over the northern part of the country, being drawn hither or thither by considerations of climate or occupation. In the northeastern states they have to a certain extent supplanted the native stock. Of all these foreigners the British are scattered the most widely over the north. The Irish are found mainly in southern New England and New York: the French Canadians almost entirely in New England, while the Germans have spread to the westward; and the Scandinavians are found in Wisconsin, Minnesota, and the Dakotas, where they have located as far north as possible without going beyond our jurisdiction. Summing up the habitat of the foreign element, we may say that it is found wherever the negro is not found, that is, throughout the north and west, while the negro is found only in the south. It results from this that in classifying these two elements of the population in accordance with the elements of climate they are found to be in the highest degree complementary. The foreign-born element constitutes about one-seventh of the total population.

A study of the environment of the population, and of these elements, is of interest, since climate and elevation have doubtless exerted a considerable influence, either directly or indirectly, in bringing about the present distribution.

The broader features of the distribution of population are as follows: that the great body of the inhabitants are found in the eastern part of the country and in middle latitudes, and, of course, in that part of the country which is drained to the Atlantic Ocean. Moreover, that nearly half the population of the country is located in the drainage basin of the Mississippi River.

The great body of the inhabitants live at low altitudes above the sea, nine-tenths being found at a less elevation than 1500 feet, and three-fourths of them below 1000 feet.

As to temperature, the great body of the population live where the mean annual temperature is between 45 and 55 degrees, and as to rainfall, the majority live where its mean annual amount is between 30 and 50 inches.

Considering the two elements, the foreign born and the colored, the former are found in northern latitudes and the latter in southern latitudes. While both elements are found at low altitudes, the colored seek the low coast regions, and avoid high altitudes in a much greater degree than the foreign born do. As to temperature, the foreign born are found under much colder conditions than the colored, the latter seeking a hot climate, while the former are found under colder conditions than the average of the total population. The case is similar, though in a less degree, in regard to rainfall, the colored seeking regions of great rainfall, while the foreign born are found where the rainfall is very much less.

The habitat of the people as regards elevation, temperature, and rainfall is summed up in the following table, showing the average elevation, average mean annual temperature, and average mean annual rainfall under which the total population, the foreign born, and the colored elements were living in 1890.

	Total Population.	Foreign Born.	Colored.
Average elevation (feet)	788	890	427
Mean annual temperature (degrees Fahrenheit) . . .	53	48	61
Mean annual rainfall (inches)	41.4	37.7	50.9

A PRELIMINARY REPORT ON ANTHROPOMETRY IN THE UNITED STATES.

BY EDWARD MUSSEY HARTWELL, PH.D., M.D.,

DIRECTOR OF PHYSICAL TRAINING IN PUBLIC SCHOOLS OF BOSTON, MASSACHUSETTS.

The writer has adopted the above title for this paper since his chief purpose, at this time, is to call attention to the number and variety of the publications which relate to anthropometry in the United States, without attempting a complete or critical analysis of any of them. It is also proper to note that the appended Provisional List includes several titles of books and articles which have been published in Europe by American writers, and a few titles of articles relating to anthropometry in America by European writers.

In this paper the term anthropometry is used in the sense originally attributed to it by Quetelet, which includes the measure of the different faculties of the human being; although anthropometrical study in the United States has been pursued, for the most part, for the sake of determining the physical proportions of the body and its parts.

Considered as a whole, the American literature on anthropometry consists largely of descriptive and tabulated reports of the results reached by individual observers in comparatively narrow and disconnected fields of investigation. A very considerable amount of material has been amassed, but much of it is so heterogeneous as to remind one of a heap of nuggets of crude ores of different kinds, which, to yield true metal, must needs be sorted, roasted, and refined. Nevertheless, in spite of some vagueness of aim and considerable diversity of methods, a sufficient amount of valuable material has been published in relation to the growth and development of children and adolescents to warrant an earnest and laborious attempt to sift, collate, and recast it in such wise as to make it available for the purposes of the vital statistician,

the biologist, the psycho-physicist, and even the routine educationist. It is clearly the part of wisdom to utilize the material at present in hand, partly in order that its actual value may be ascertained, and partly because a comprehensive and searching study of it would serve to indicate what problems should be attacked next, and to suggest the most hopeful means of attack in such problems.

That the study of anthropometrical problems has become more extensive and diversified recently is rendered evident by comparing the number and variety of the titles of works published since 1880, or even since 1890, with those published between 1850 and 1880. (See appended Provisional List.) It is noteworthy, moreover, that interest in the physiological and psycho-physical bearings of anthropometrical science is steadily increasing. [See the articles by Bolton (7), Bryan (12), Burnham (13), Gilbert (15), Porter (22), Scripture (26), and West (31) cited below].

As regards amount of statistical data and the discussion of theoretical questions, the weightiest contributions to anthropometrical science in America have been made in the department of Military Anthropometry by Messrs. Elliott (55), Gould (57), and Baxter (52). Next in rank, in the order named, are the departments of Anthropometry of School Children (see Bowditch, 8, 9, and 10; Peckham, 20 and 21; Porter, 22-25; and Boas, 5 and 6); and the Anthropometry of Students (see Hitchcock, 91-102; Sargent, 106-109; Enebuske, 88 and 89; and Wood, 113-117). The papers of Beyer (53), Enebuske (88 and 89), and Porter (22) give evidence of a growing tendency to attempt to correlate the results of anthropometrical investigations, and the teachings of physiology as to the development of functional power. In the field of criticism and discussion of methods the articles of Boas (34), Gulick (38), and Porter (47) mark a new and hopeful departure. Minot's paper (45) is a valuable contribution to the theory of growth. Spiess, of Frankfurt am Main, and Geissler and Ulitzsch, in Saxony, measured large

numbers of school children, in respect to height, in order to determine the normal dimensions of desks and seats to be used in school by the children in question. It would appear that no investigations of this sort, worthy of mention, have been made as yet in this country.

Dr. Bowditch's papers are of capital importance, by reason of the light they throw on the law of growth, and the significance of the physical changes incident to puberty. Their bearing upon school management has not been sufficiently recognized as yet by school authorities in this country. Dr. Bowditch is now generally credited with being the first to show that boys and girls have different rates of growth, as regards height and weight; and his observations and conclusions have been strikingly corroborated by Peckham, Porter, and West in the United States, and by the investigations of a Royal Commission in Denmark, by Roberts in England, Pagliani in Italy, Erismann in Russia, Geissler and Ulitzsch in Saxony, and by Axel Key in Sweden.

The writer, who is at present engaged in making a comparative study of mortality and growth rates, finds that there is a striking relation between the death rates of Boston boys and girls and their respective rates of growth, as determined by Bowditch. That is to say, the death rates of Boston boys are lowest during the period of their most rapid growth, and the death rates of Boston girls are lowest during their period of most rapid growth. He also finds that a similar relation exists between the death and growth rates of Swedish boys and girls. The results of the writer's investigations touching this question will be published shortly in the *Quarterly Publications of the American Statistical Association*.

The use of anthropometry as a means for guiding and testing procedures in physical training is becoming general in the leading colleges for men and women, and in a few secondary and special schools, and in the Y. M. C. A. Herein is found one of the most characteristic developments of anthropometry in America. In this connection, special mention

should be made of the life size "anthropometric statues" exhibited by Dr. Sargent in the Anthropological Department of the Columbian Exposition, since they constitute a unique and highly interesting contribution to anthropometry. They are intended to represent the bodily proportions and conformation of the typical college man and college woman, and are based on extensive unpublished data belonging to Dr. Sargent. The Bertillon anthropometrical system, for the identification of criminals, has been adopted by a few penal institutions. Extensive anthropometrical investigations have recently been made upon American Indians under the supervision of Dr. Franz Boas. The results of Dr. Boas's studies remain to be published. The amount of undigested and unpublished material in military, prison, school, and college anthropometry is now very extensive, and increases yearly.

Hitherto American anthropometrists, as a rule, have worked too much apart from one another, along short lines, and within comparatively narrow limits. It is time to attempt to bring about a closer organization, one that shall conduce to unity of purpose and intelligent coöperation in the field of investigation, and to the adoption of the most approved scientific methods of recording, collating, and publishing the results of such investigations. Such an organization should also seek to keep heartily and thoroughly in touch with the anthropometrists of Europe. It is to be hoped that the recent establishment of special committees on anthropometry by the International Statistical Institute, and of the American Statistical Association, respectively, will tend to promote a more vigorous and intelligent prosecution of anthropometrical studies on both sides of the Atlantic.

PROVISIONAL LIST OF WORKS — ARTICLES, BOOKS, AND TABLES —
RELATING TO ANTHROPOMETRY IN THE UNITED STATES, INCLUDING 117 TITLES, ARRANGED IN CLASSES I-VI.

Class I, Nos. 1-3, titles relating to Art.

Class II, Nos. 4-33, titles relating to Anthropometry of Children.

Class III, Nos. 34-51, titles relating to Methods in Anthropometry.

Class IV, Nos. 52-58, titles relating to Military and Naval Anthropometry.

Class V, Nos. 59-85, titles relating to Miscellaneous Topics in Anthropometry.

Class VI, Nos. 86-117, titles relating to Anthropometry of Students.

ANALYSIS OF TITLES ACCORDING TO DATE OF PUBLICATION AND CLASS OF SUBJECT.

	1. Art.	2. Children.	3. Methods.	4. Military.	5. Miscellaneous.	6. Students.	Total.
Period 1850-60	0	0	0	1	2	0	3
Period 1860-70	1	0	0	2	4	1	8
Period 1870-80	1	3	0	1	2	0	7
Period 1880-90	1	8	8	1	8	10	36
Period 1890-94	0	19	10	2	11	21	63
Sum	3	30	18	7	27	32	117

CLASS I. TITLES RELATING TO ART.

1. ALLEN, H. *An Analysis of the Life-Form in Art.* Philadelphia, 1875. 4to.
2. FLETCHER, R. *Human Proportion in Art and Anthropometry.* A lecture delivered at the National Museum, Washington, D. C. Cambridge. 1883. M. King. 37 p. 4 pl. 8vo.
3. STORY, W. W. *The Proportions of the Human Figure, According to a New Canon, for Practical Use: with a Critical Notice of the Canon of Polycletus, and of the Principal Ancient and Modern Systems.* London, 1866. 8vo.

CLASS II. TITLES RELATING TO ANTHROPOMETRY OF CHILDREN.

4. ABBOTT, S. W. *The Evidence of Still-Birth.* Transactions of Massachusetts Medico-Legal Society. I. 56. Boston, 1879. Relates to length and weight of infants at birth.
5. BOAS, F. *Anthropological Investigations in Schools.* Pedagogical Seminary, Worcester, Mass., 1891. I. 225-228. Also in *Science*, New York, 1891. Vol. xvii, 351-352.
6. ——— *The Growth of Children.* *Science.* New York, 1892. Vol. xix, 256; 281-282; xx, 351-352.
7. BOLTON, T. L. *The Growth of Memory in School Children.* American Journal of Psychology. 1892. Vol. iv, 189-192; 362-380.
8. BOWDITCH, H. P. *The Growth of Children.* Report of Board of Health of Massachusetts. Boston, 1877. Vol. viii. 51 p., 10 tables.
9. ——— *The Growth of Children: a Supplementary Investigation, with Suggestions in Regard to Methods of Research.* Report of Board of Health of Massachusetts. Boston, 1879. Vol. x. 33-62. 11 pl.
10. ——— *The Growth of Children. Studied by Galton's Method of Percentile Grades.* Report of Board of Health of Massachusetts, 1889-90. Boston, 1891. Vol. xxii. 479-522.
11. ——— *The Relation between Growth and Disease.* Reprinted from Transactions of the American Medical Association. Philadelphia, 1881. 9 p.
12. BRYAN, W. L. *On the Development of Voluntary Motor Ability.* American Journal of Psychology. Worcester, 1892. Vol. v. 125-204. 3 charts.
13. BURNHAM, WM. II. *A Scheme of Classification for Child-Study.* Pedagogical Seminary. Worcester, Mass., 1893. Vol. ii. 191-198.
14. CHAILLE, S. E. *Infants: their Chronological Progress.* New Orleans Medical and Surgical Journal, 1886-87. N. S. Vol. xiv. 893-912. Also reprint.
15. GILBERT. *Experiments on the Musical Sensitiveness of School Children.* Studies from the Yale Psychological Laboratory. 1892-93. 80-87.
16. GREENWOOD, J. M. *Heights and Weights of Children.* American Public Health Association Report, 1891. Concord, N. H., 1892. Vol. xvii. 199-204.

17. HINDS, CLARA BLISS. *Child Growth*. Reprint of paper before Women's Anthropological Society of Washington. Washington, D. C., 1886. 8 p.
18. MOON, S. B. *Measurements of the Boys of the McDonogh School for the Years 1888-1891: arranged in Order of Height, Summed and Averaged. Also a Percentile Table for 115 Boys 13-14 Years of Age*. McDonogh, Maryland, 1892. 46 p. 4to.
19. MORSE, W. H. *The Baby's Growth*. Virginia Medical Monthly. Richmond, 1886-87. Vol. xiii. 392-395.
20. PECKHAM, GEORGE W. *The Growth of Children*. Report Wisconsin Board of Health, 1881. Madison, 1882. Vol. vi. 28-73. 2 pl. 12 diag.
21. ——— *Various Observations on Growth*. Ibid, 1882. Madison, 1883. Vol. vii, 185-188.
22. PORTER, W. T. *The Growth of Saint Louis Children*. Transactions of the Academy of Science of St. Louis, 1894. In press.
23. ——— *The Physical Basis of Precocity and Dullness*. Transactions of the Academy of Science of St. Louis. St. Louis, 1893. Vol. vi. 161-181.
24. ——— *The Relation between the Growth of Children and their Deviation from the Physical Type of their Sex and Age*. Transactions of the Academy of Science of St. Louis. St. Louis, 1893. Vol. vi. 233-250. 8 tables. 1 diag.
25. ——— *Ueber Untersuchungen der Schulkinder auf die Physischen Grundlagen ihrer geistigen Entwicklung*. Read in Berliner Gesellschaft für Anthropologie, Ethnologie, und Urgeschichte, 15 July, 1893. Zeitschrift für Ethnologie. Berlin, 1894. 337-354.
26. SCRIPTURE, E. W. *Tests on School Children*. Educational Review. New York, 1893. Vol. I. 52-61.
27. STOCKTON-HOUGH, J. *Statistics Relating to Seven Hundred Births (White) Occurring in the Philadelphia Hospital, between 1865 and 1872*. Philadelphia Medical Times, 1885-86. Vol. xvi. 92-94.
28. WEST, G. M. *Anthropometrische Untersuchungen über die Schulkinder in Worcester, Mass.* Archiv für Anthropologie. Braunschweig, July, 1893. Vol. xxii. 13-48; 23 tables; 5 diag.
29. ——— *The Anthropometry of American School Children*. Proceedings of the International Congress. Chicago, 1893. In press.

30. — *The Anthropometry of Japanese School Children.* In press.
31. — *Eye-Tests on School Children.* American Journal of Psychology. 1892. Vol. iv. 595–596.
32. — *The Growth of the Breadth of the Face.* Science. New York, 1891. Vol. xviii. 10–11.
33. — *Worcester (Mass.) School Children; the Growth of the Body, Head, and Face.* Science. New York, 1893. Vol. xxi. 2–4.

CLASS III. TITLES RELATING TO METHODS IN ANTHROPOMETRY.

34. BOAS, F. *The Theory of Anthropometrical Statistics.* Paper read September 16, 1893, before the International Statistical Institute, at Chicago. Quarterly Publications of the American Statistical Association. Boston, Dec., 1893.
35. GALTON, FRANCIS. *Useful Anthropometry.* Proceedings of the American Association for Advancement of Physical Education, 1891. Ithaca, N. Y., 1891. Vol. vi. 51–57.
36. GIHON, A. L. *Physical Measurements.* Wood's Reference Hand-book of the Medical Sciences. New York, 1887. Vol. v. 667–673.
37. GREENLEAF'S, DR., *New Table of Physical Proportions.* Baltimore Underwriter. 1890. Vol. xliii. 303.
38. GULICK, L. *Manual for Physical Measurements, in Connection with the Y. M. C. Association Gymnasium Records.* New York, 1892.
39. — *The Value of Percentile Grades.* Quarterly Publications of the American Statistical Association. Boston, 1893. N. S. Nos. 21, 22. 321–331.
40. HITCHCOCK, E., JR. *Physical Measurements, Fallacies, and Errors.* Proceedings American Association for Advancement of Physical Education, 1887. Brooklyn, N. Y., 1887. Vol. iii. 35–42.
41. HOLGATE, T. H. *An Instrument for Measuring the Lower Extremities Correctly.* Medical Record. New York, 1881. Vol. xx. 164.
42. HURD, KATE C. *Some of Galton's Tests Concerning the Origin of Human Faculty.* Proceedings American Association for Advancement of Physical Education, 1891. Ithaca, N. Y., 1891. Vol. vi. 80–96.

43. JACKSON, W. A. J., JR. *Graphic Methods in Anthropometry*. Physical Education. Springfield, Mass., 1893. Vol. ii. 89-94.
44. KELLOGG, J. H. *A New Dynamometer for Use in Anthropometry*. Battle Creek, Michigan, 1893. No imprint.
45. MINOT, C. S. *Growth*. Reference Hand-book of the Medical Sciences. New York, 1886. Vol. iii. 394-400.
46. MULLER, G. *Alphonse Bertillon's Method for the Identification of Criminals*. Anthropometric Identifications. Adopted by the Wardens' Association for the Registration of Criminals, at their meeting in Toronto, September, 1887. Instructions for taking measurements and descriptions. Translated from the French by Gallus Muller, Clerk of the Illinois State Penitentiary. Joliet, Ill., 1887. 84 p. 8vo.
47. PORTER, W. T. *On the Application to Individual School Children of the Means Derived from Anthropological Measurements by the Generalizing Method*. Paper read September 16, 1893, before the International Statistical Institute, at Chicago. Quarterly Publications of the American Statistical Association. Boston, Dec., 1893.
48. SARGENT, D. A. *Report on Anthropometric Measurements. A Schedule of Measurements with Directions for Making Them*. Presented by a Committee of the A. A. A. P. E., through its Chairman, Dr. Sargent, and adopted by the Association, November 26, 1886. Proceedings American Association for Advancement of Physical Education, 1886. Brooklyn, N. Y., 1886. Vol. ii. 6-15.
49. — *Anthropometric Apparatus, with Directions for Measuring and Testing the Principal Physical Characteristics of the Human Body*. Cambridge, Mass., 1887. 8vo.
50. SEAVER, J. W. *Anthropometry and Physical Examination. For Practical Use in Connection with Gymnasium Work and Physical Education*. New Haven, 1890. 127 p.
51. SWAIN, F. *Anthropometric Measurements*. Proceedings American Association for Advancement of Physical Education, 1887. Brooklyn, N. Y., 1887. Vol. iii. 43-50.

CLASS IV. TITLES RELATING TO MILITARY AND NAVAL ANTHRO-
POMETRY.

52. BAXTER, J. H. *Statistics, Medical and Anthropological, of the Provost-Marshal-General's Bureau, Derived from Records of the*

- Examination for the Military Service in the Armies of the United States During the Late War of the Rebellion of over a Million Recruits, Drafted Men, Substitutes, and Enrolled Men.* Compiled under direction of the Secretary of War. 2 vols. 4to. Washington, D. C., 1875.
53. BEYER, H. G. *Observations on Normal Growth and Development of the Human Body Under Systematized Exercise.* Report of Surgeon-General of the U. S. Navy, 1893. Washington, D. C., 1893. 141-160. 16 tables in text.
54. COOLIDGE, R. H. *Statistical Report on the Sickness and Mortality of the Army of the United States, Compiled from the Records of the Surgeon-General's Office, from January, 1839, to January, 1855.* Washington, D. C., 1856.
55. ELLIOTT, E. B. *On the Military Statistics of the United States of America.* Printed for the United States Sanitary Commission. Berlin, 1863. 44 p. 2 pl. 4to.
56. GIHON, A. L. *A Study of Adolescent Growth, Based on the Physical Examination of 6129 Naval Cadets and Candidates for Appointment as Cadets, and 2058 Naval Apprentices.* Report of the Surgeon-General United States Navy. Washington, D. C., 1880. 15-44.
57. GOULD, B. A. *Investigations in the Military and Anthropological Statistics of American Soldiers.* U. S. Sanitary Commission. New York, 1869. 655 p. 8vo.
58. STERNBERG, GEORGE M. *Physique of Accepted Recruits and Re-enlisted Men (U. S. Army), 1892.* Report of the Surgeon-General of the Army to the Secretary of War, 1893. Washington, D. C., 1893. 20; 226-227.
- Table xxv gives average height, weight, and chest measure of 9585 recruits (8555 white, 833 colored, 197 Indian).

CLASS V. TITLES RELATING TO MISCELLANEOUS TOPICS IN ANTHROPOMETRY.

59. BEARD, G. M. *English and American Physique.* North American Review. New York, 1879. Cxxxix. 588-603.
60. BOAS, F. *Physical Characteristics of the Indians of the North Pacific Coast.* American Anthropologist. 1891. Vol. iv. 25-32.
61. BOWDITCH, H. P. *On the Collection of Data at Autopsies.* A report presented to the Massachusetts Medico-Legal Society, February 1, 1882. Reprint. No imprint.

62. ——— *The Physique of Women in Massachusetts*. Report of Board of Health of Massachusetts, 1889. Boston, 1890. Vol. xxi. 287–304. 1 table. Also reprint.
63. BRADFORD, E. H. *The Effect of Recumbency on the Length of the Spine*. Boston Medical and Surgical Journal. 1883. Vol. cix. 245.
64. BRINTON, D. G. *External Mensuration of the Human Subject*. Medical and Surgical Reporter. Philadelphia, 1869. Vol. xx. 1–2.
65. CORDEIRA, F. J. B. *A Contribution to Anthropometry*. New York Medical Journal. New York, 1887.
66. DICKSON, S. H. *Statistics of Height and Weight in the South*. Charleston Medical Journal and Review, 1857. Vol. xii. 607–613.
67. ——— *Some Additional Statistics of Height and Weight*. Ibid. 1858. Vol. xiii. 494–506.
68. ——— *Statistics of Height and Weight*. American Journal of Medical Sciences. Philadelphia, 1866. N. S. Vol. lii. 373–380.
69. DUN, W. A. *The Police Standard of Cincinnati; with some Statistics Compiled from the First Thousand Examinations of Applicants*. Cincinnati Lancet-Clinic, 1887. N. S. Vol. xviii. 131–135; 767–769.
70. FRENCH, M. S. *Report of the Physical Examination of Men upon the Police Force of Philadelphia, and those who were Applicants for Appointment*. Philadelphia, 1885.
71. HARTWELL, EDWARD M. *Preliminary Report on Anthropometry in the United States. With Provisional List of Works Relating to Anthropometry in the United States*. Paper read before the International Statistical Institute at Chicago, September 16, 1893. Quarterly Publications of the American Statistical Association. Boston, Dec., 1893.
72. HURD, KATE C. *On Anthropometry*. Times and Register. New York and Philadelphia, 1890. Vol. vii. 506–511.
73. KELLOGG, J. H. *Outline Studies of the Human Figure, Comprising 118 Figures which Embody the Results of Several Thousand Observations, Embracing Studies of a Number of Different Civilized and Uncivilized Races*. Modern Medicine Publishing Co. Chicago, London, and Battle Creek, Mich., 1893.

74. — *Physical Chart, Arranged from Results Obtained in Testing the Strength of Individual Groups of Muscles in 200 Men, Ages 18–30 Years, by Means of Dr. Kellogg's Mercurial Dynamometer.* Battle Creek, Mich., 1893.
75. — *Physical Chart, Arranged from the Results Obtained in Testing the Strength of the Individual Groups of Muscles in 600 Men by Means of a Universal Mercurial Dynamometer.* Battle Creek, Mich., 1893.
76. — *Physical Chart, Arranged from the Results Obtained from Testing the Strength of the Individual Groups of Muscles in 600 Women by Means of a Universal Mercurial Dynamometer.* Battle Creek, Mich., 1893.
77. — *Table of Strength Measurements, Arranged from the Measurements of 100 Adult Women.* Battle Creek, Mich., 1891.
78. — *Table of Strength Measurements, Arranged from the Measurements of 100 Adult Men.* Battle Creek, Mich., 1891.
79. LEE, C. A. *A Table Showing the Physical Characteristics of the Members of the United States Senate.* First Session 39th Congress. Buffalo Medical and Surgical Journal, 1866–67. Vol. vi. 390–396.
80. MORRIS, M. *Biomtry: its Relation to the Practice of Medicine.* Medical Record. New York, 1875. Vol. x. 481–486.
81. RUSCHENBERGER, W. S. W. *Contributions to the Statistics of Human Growth.* American Journal of Medical Sciences. Philadelphia, 1867. N. S. Vol. liii. 67–70.
82. SARGENT, D. A. *The Physical Development of Women.* Scribner's Magazine, February, 1889. Vol. v. 172–185.
83. TITCHENER, E. B. *Anthropometry and Experimental Psychology.* Philosophical Review. Boston, New York, and Chicago, 1893. Vol. ii. 187–192.
84. WEST, G. M. *The Anthropometry of North American Mulattoes.* In press.
85. WILKINS, W. W. *Comparative Measurements of the Chest.* Transactions of New Hampshire Medical Society. Manchester, N. H., 1886: 125–130.

CLASS VI. TITLES RELATING TO ANTHROPOMETRY OF STUDENTS.

86. ALLEN, N. *Physical Culture in Amherst College.* 8vo. Lowell, 1869.

87. ANDERSON, W. G. *Students in Gymnasium*. Adelphian. Brooklyn, 1885. Vol. v. No. 1. 10.
88. ENEBUSKE, CLAËS J. *An Anthropometrical Study of the Effects of Gymnastic Training on American Women*. Paper read September 16, 1893, before the International Statistical Institute, at Chicago. Quarterly Publications of the American Statistical Association. Boston, Dec., 1893.
89. — *Some Measurable Results of Swedish Pedagogical Gymnastics*. Proceedings of American Association for Advancement of Physical Education, 1892. Springfield, Mass., 1893. Vol. vii. 207–235. 8 tables in text.
90. HANNA, DELPHINE. *Anthropometric Tables, Compiled from the Measurements of 1600 Women (Oberlin Students), Department of Physical Training Oberlin College*. Oberlin, Ohio, 1893. No imprint.
91. HITCHCOCK, E. *An Anthropometric Study of the Students of Amherst College, Constructed upon Bodily Stature as the Basis of Comparison*. Second edition. 1893. No imprint. Contained also in No. 102.
92. — *Average and Mean Anthropometric Data of Amherst College Students*. 1888. 8vo. No imprint.
93. — *Comparative Study of Measurements of Male and Female Students at Amherst, Mount Holyoke, and Wellesley Colleges, U. S. A.* Physique. London, 1891. Vol. i. 90–94. Also in Proceedings of American Association for Advancement of Physical Education. Ithaca, N. Y., 1891. Vol. vi. 37–42.
94. — *The Distribution of Physical Measurements Shown in the Different Years of College Life*. Amherst College. 1892. No imprint.
95. — *The Gain in Physical Strength of College Students*. Two tables. Amherst, 1892. No imprint.
96. — *Physical Growth of Amherst Students. Gain Between Freshman and Senior Years*. 1892. No imprint.
97. — *The Results of Anthropometry as Derived from the Measurements of the Students in Amherst College*. Amherst, Mass., 1892. 7 p. 6 tables. 8vo.
98. — *Summary of Anthropometrical Studies of the Students of Amherst College*. Paper read September 16, 1893, before the

International Statistical Institute, at Chicago. Quarterly Publications of the American Statistical Association. Boston, Dec., 1893.

99. HITCHCOCK, E., JR. *A Synoptic Exhibit of 15,000 Physical Examinations.* Made on male college students. Ithaca, N. Y., 1890.

For summary of averages shown graphically in above table see Proceedings of American Association for Advancement of Physical Education, 1890. Ithaca, N. Y., 1890. Vol. v. 5.

100. — *Report on Physical Culture to the President of Cornell University.* Contains two tables showing the standing in scholarship of Cornell oarsmen, base-ball men, and members of athletic teams; and seven synoptic anthropometric charts. See Appendix II. Annual Report of the President of Cornell University for 1887–88. Ithaca, N. Y., 1888. 111–125.
101. HITCHCOCK, E., and SEELYE, H. H. *An Anthropometric Manual, giving the Average and Mean Physical Measurements and Tests of Male College Students, and Modes of Securing them.* Prepared from the Records of the Department of Physical Education and Hygiene in Amherst College during the Years 1861–62 and 1887–88, inclusive. 2nd ed. Amherst, Mass., 1889. J. E. Williams. 37 p. 1 table. 8vo.
102. — *An Anthropometric Manual giving Physical Measurements and Tests of Male College Students and the Method of Securing them.* Prepared from the Records of the Department of Hygiene and Physical Education in Amherst College during the years 1861–62 and 1892–93, inclusive. Third edition. Amherst, Mass. Carpenter and Morehouse. 1893, 8vo. 35 p. 3 tables.
103. JACKSON, W. A., JR. *Tables of the Anthropometric Measurements of the Williston Seminary Students (140 in Number), 1891–92.* The Willistonian, March 5, 1892. Easthampton, Mass., 1892. 3 tables.
104. LADD, CAROLYN C. *Physical Training in its Relation to the Health and Education of Women.* Report of the Proceedings of Fifteenth Annual Meeting of the Alumnae Association of the Woman's Medical College of Pennsylvania, March 14, 1890. Philadelphia, 1890. 42–54.
105. MCNAIR, ANNA D. *Statistics of Work done in Bryn Mawr College Gymnasium.* Bryn Mawr, Pennsylvania. In press.

106. SARGENT, D. A. *Anthropometric Chart Showing the Relation of the Individual in Size, Strength, Symmetry, and Development to the Normal Standard.* Cambridge, Mass., 1886.
107. — *Anthropometric Chart Showing the Distribution of an American Community as to Physical Power and Proportions; also the Relation of the Individual in Size, Strength, Symmetry, and Development to the Normal Standard of the same Age.* Cambridge, Mass., 1893.
108. — *The Physical Proportions of the Typical Man.* Scribner's Magazine, July, 1887. Vol. ii. 3-17. Illustrated.
109. — *The Physical Characteristics of the Athlete.* Ibid. November, 1887. Vol. ii. 541-561. Illustrated.
110. SEAVER, J. W. *Anthropometric Table Arranged from the Measures of 2300 Students.* New Haven, 1889.
111. TOPINARD, P. *L'Anthropométrie aux États-Unis.* Revue d'Anthropologie. Paris, 1889. 3^e S. Vol. iv. 337-345. A review of works by Hitchcock and Sargent.
112. TUCKERMAN, F. *Anthropometric Data Based upon Nearly 3000 Measurements Taken from Students.* Amherst, 1888. 1 pl. 8vo.
113. WOOD, M. ANNA. *Anthropometric Table, Arranged After the Method of Percentile Grades, of the Measurements of 1500 Wellesley College Students (Female).* No date; no imprint.
114. — *Anthropometric Table, Compiled from the Measurements of 1100 Wellesley College Students (Female); Arranged According to Bodily Heights.* 1890. No imprint.
115. — *Six Comparative Tables Showing Records of Class Crews Receiving Training in Gymnasium and on the Lake; of Twenty Students Receiving Training in the Gymnasium; and of Twenty Students Receiving no Training in the Gymnasium.* Wellesley College. President's Report. Boston, 1893. 35-40.
116. — *Statistical Tables Concerning the Class of 1891 of Wellesley College, numbering 104 Women.* 16 p. 4to. No imprint.
117. — *Statistical Tables, Showing Certain Measurements of 40 Freshmen (Female) of Wellesley College, at the Beginning (November, 1891) and End (May, 1892) of Six Months of Gymnastic Training.* 1892. 7 p. 4to. No imprint.

REMARKS ON THE THEORY OF ANTHROPOMETRY.

BY FRANZ BOAS, PH.D.

The theory of anthropometric statistics is based largely upon Quetelet's investigations, who endeavored to prove that the distribution of anthropometric data follows the law of chance. Some attempts to develop the theory further have been made by Stieda and Ihering and by Francis Galton. The former emphasized the introduction of the average variation of measurements into the consideration of the subject, the latter developed what has become known as the method of percentile grades. Stieda was also the first to express a doubt as to the general applicability of the law of chance.

The anthropometric characteristics of a group of people are treated in various ways. Some authors consider the average of the measurements the most valuable result; others prefer to compute the mean value, which is, more properly speaking, the probable value, as it is computed as that value above and below which fifty per cent of the whole series are found; still others compute the most frequent value. The followers of Francis Galton compute the mean value and the points representing various percentile grades, *i. e.*, points below which ten per cent, twenty per cent, thirty per cent, and so forth, of the total series are found. Anthropologists who study the physical characteristics of races use mostly the method of seriation. They give the percentage of cases of the series which fall between certain limits. Still another method which is frequently applied consists in the comparison of those percentages of the series which lie above or below a certain limit.

We will examine the merits of these methods. Whenever

the distribution of measurements follows the laws of chance the average may be considered the type represented by the series. In this case the average, the probable value, and the most frequent value will be identical, provided the series of observations is sufficiently large. In practice they will naturally always show slight differences. In these cases the average must be used, not the probable or the most frequent value, because the first named can be determined with greater accuracy than the others. When a limited number of observations are given, and the mean error of the average, of the probable value, and of the most frequent value are computed, it is found that the mean error of the average is smaller than that of the probable value; the mean error of the latter is, in turn, smaller than that of the most frequent value. For this reason the probable value, or, as it is often called, the mean value, or the fifty percentile grade, must not be used for the purpose of describing the type of a series of measurements which are distributed according to the laws of chance.

When the distribution of cases does not correspond to the laws of chance, neither the average, nor the probable value, nor the most frequent value can be utilized without a previous theoretical treatment of the curve representing the laws of distribution. Based on Quetelet's statements, it has generally been assumed that all anthropometric measurements are distributed according to the laws of chance, and that the curves will approach the theoretical curve the more closely the greater the number of cases that is embodied in the series. I believe that Stieda was the first to intimate that deviations from the law may occur, although he does not follow out this suggestion. A. and J. Bertillon have proved that such deviations occur. Later on, Bowditch has shown that the curves showing the distribution of statures and weights of children do not follow the laws of chance. He shows this by pointing out the fact that during the period of growth a constant difference exists between the average and probable

values. Galton also paid some attention to this subject, and Dr. Gulick mentioned it in a recent paper. Glancing over the curves representing large series of measurements, it strikes me that they conform to the laws of chance only in a general way, and that considerable deviations are quite frequent. It is necessary to consider the biological laws underlying the phenomena under consideration. Assuming that there is a uniform ancestral type in a certain district, and that the conditions of life remain stable, we may expect that the people representing its offspring will be grouped around the type according to the laws of chance. Assuming, however, that there were two distinct ancestral types in adjoining districts, and that these types intermingled, we cannot foretell what the distribution of forms among the offspring will be. It may be that they represent an intermediate type between the parental forms. In this case we might expect to find them distributed according to the laws of chance. But it may also be that we find them to have a tendency to reproduce one or the other ancestral type, either pure or slightly modified. In this case the resulting curve would not conform to the laws of chance, and would show an entirely different character. There is considerable evidence that the laws of inheritance are such that there exists a tendency of reproducing ancestral traits, not of producing new intermediate traits. Therefore, we may be prepared to find considerable deviations from the laws of chance. It is clear that, if intermixture does not result in producing an intermediate type, an attempt to express the type by means of an average of the existing forms will have no meaning whatever. The probable value would have just as little meaning. If the two parental forms were entirely distinct and reproduced without change, the most frequent values might have a meaning, as the two forms would occur most frequently. This, however, would depend upon many conditions favorable to such a result; the proportion of the two elements would have to be nearly equal, their difference

great, and each form must have a limited amount of variability only. A concrete case of this kind is found in the anthropometry of the half-blood race of Indian and white parentage. Generally speaking, the ancestry of a people will be such that a number of forms which do not differ very much among themselves enter into its composition. The greater the number of forms, the nearer the curve of measurements will conform to a probability curve; but, nevertheless, it must be borne in mind that the mixture may be such that constant deviations from such a curve are found which are not due to accident. Our conclusion from these considerations is that anthropometric measurements do not, as a rule, follow the laws of chance, and that a careful examination of the curves is necessary in each case. We cannot expect that in all cases a classification of the material will lead to curves which follow the laws of chance more closely, as the laws of heredity are such that they do not necessitate an arrangement of this character. These facts must make us very careful in the use of the average considered as the type of a series. It will be necessary to investigate each series in order to ascertain if there are any deviations from the law of chance which seem to be due to constant causes, not to accident.

Besides these biological considerations, we must consider a number of other factors which may cause deviations from the probability curve. If a series of measurements is distributed according to the laws of chance, and the measurements of the whole series are changing, deviations will occur whenever the rate of change is not uniform. Such changes occur during the period of growth, and this is the cause of the asymmetry of distribution of measurements of children to which Dr. Bowditch called attention. Similar changes may occur when the conditions of life of a community are changing, or when one form is gaining preponderance over another form. In all such cases the computation of the average, of the mean, and of the most frequent value have no

meaning. The cause and character of the asymmetry of the curve must be determined, and a mathematical treatment must be applied which takes the asymmetry into consideration. It is not necessary to elaborate the theory of treatment of such curves, as the treatment depends upon the character of the asymmetry. It will be sufficient to say that during a period of acceleration in the increase of the measurement the average will always be too great as compared to the typical value for the period under consideration, while for a period of retardation in the increase of the measurement the reverse is the case. For this reason the values for average statures at a certain age which have been computed so often have no biological value as typical statures for the respective age.

I believe I have shown that we must exercise great care in the application of the method of averages, particularly that we cannot assume the average to be the type of a series without a careful scrutiny of its character.

This is still more true if we consider correlations of measurements. It is generally assumed that when a group of measurements of a series of individuals is taken the combination of the average of the measurements will represent the typical individual. Dr. Sargent's statues of the typical American are based on this assumption. The first objection to this assumption is based on the well-known fact that, if a variable is given and a function of the same, then the average of the function is not identical with the function of the average of the variable.

Furthermore, the general distribution of the measurement may apparently correspond to the law of chance, although a number of distinct types are represented in the series whose presence may be revealed by a classification of the whole series. For example: If the measurements of the Indians around the Great Lakes were tabulated without a subdivision into tribes, it would be found that their length of head and breadth of head are distributed according to the laws of

chance. The average length of head would be 198 mm., the average breadth of head 155 mm. According to the method under consideration, this would be the typical combination. When the tribes are properly subdivided in an eastern and a western group, it will be found that the length of head is 195 mm. in the west, 191 in the east, and that 198 does not represent the type of any one tribe. These people speak the same language, and might be gathered on one reservation. In that case a subdivision would be impossible, and an erroneous result would be obtained. Therefore, a critical study of distributions must precede the establishment of the type. The theory of statistics points to a clear way for this study, but unfortunately it has never been applied up to this time. The study must be based on a comparison of the variabilities of measurements. Whenever the variability of a measurement that is correlated to another one is abnormally increased we must suppose that there is an intermixture of types.

I must add a few words regarding the subject of correlations.

The admirable investigations of Mr. Alphonse Bertillon and those of Sören-Hansen, Bischoff, and others have proved that with increasing height all other measurements increase not proportionally, but at a slower rate. This law may be given a wider meaning by saying that whenever a group of people are arranged according to one measurement, with the increase of this measurement all others increase at a slower rate, the rate being the slower the slighter the correlation. This law leads us to establish the fact that we must consider each measurement as a function of a number of variable factors which represent the laws of heredity and environment. The correlation of two measurements will be close when they depend largely upon the same factor, slight when they depend largely upon distinct factors. This difference in the degree of correlation, which is a well-established fact, proves that the system which is applied in many of our

gymnasia is faulty. If the teacher of the gymnasium is given a pupil whose stature is, for instance, such that twenty per cent of all the individuals of his age are taller than he, then it is his ideal to train the pupil to that point that all his other measurements come up to the same standard. If all the men who have this particular stature were plotted alone, it would be seen at once that their measurements would be quite different from this assumed standard. This fundamental objection has already been raised by Dr. L. Gulick.

This assumption is one of the developments of the method of percentile grades. While this method has certain advantages in bringing home to the untrained public some of the valuable results to be gained from anthropometric inquiries, it is highly objectionable for theoretical studies. It does not explain any fact that cannot be explained just as well and with the tenth part of labor and with greater satisfaction by the method of mean variations, and whenever it has been applied it has proved to be misleading in so far as it suggests always that a certain percentile grade represents certain groups of individuals. For instance, during the period of growth, the average eighty per cent child has been assumed to represent, "on the average," the same child, which is most assuredly not the case. This method ought, therefore, to be applied with much greater care and for much more limited purposes than has been done heretofore.

I hope my remarks have served to point out some of the directions in which the theory of anthropometric statistics needs further treatment, and what defects remain to be remedied. I have in my full paper given a number of examples and elaborated the theories and methods which here I could indicate only with a few words.

ON THE APPLICATION TO INDIVIDUAL SCHOOL CHILDREN OF THE MEAN VALUES DERIVED FROM ANTHROPOLOGICAL MEASUREMENTS BY THE GENERALIZING METHOD.

BY W. TOWNSEND PORTER, M.D.,

ASSISTANT PROFESSOR OF PHYSIOLOGY IN THE HARVARD MEDICAL SCHOOL.

I.

The method employed by Quetelet in his anthropometrical studies of the phenomena of human growth was based on two fundamental propositions, (1) the mean of a great number of individuals of the same class is the *typus* or norm of the class; and (2) the deviations of individuals from the *typus* follow the law of accidental causes, and are subject to the calculus of probabilities.

From these propositions it results that the *typus* in any dimension, *e. g.*, height, at any age in the period of growth, is the mean of a sufficiently large number of observations of that dimension at the given age, and that the degree with which the observed approaches the true mean can be determined by an application of the principle of least squares.

When the means of any one dimension, for example, height at each age in the period of growth, are compared, the law of growth in that dimension is at once apparent, and may be expressed graphically in a curve whose abscissæ are years, and whose ordinates are centimetres, kilogrammes, or other units of measurement. Not only is the mean at any age thus fixed, but the probability of any given deviation from that mean is fixed as well. Thus the mean height of 2192 St. Louis Public School girls,* aged 8, is 118.36 cm., with a probable error of

* W. Townsend Porter, "The Physical Basis of Precocity and Dullness," *Transactions of the Academy of Science of St. Louis*, Vol. VI, No. 7, March 21, 1893, pp. 161-181. Also "Untersuchungen der Schulkinder in Bezug auf die physischen Grundlagen ihrer geistigen Entwicklung," read before the Berliner Gesellschaft für Anthropologie, Ethnologie, und Urgeschichte, July 15, 1893, and published in Virchow's *Zeitschrift für Ethnologie*.

0.079 cm., and a probable deviation of 3.7 cm. This being known, it follows that of the 50 per cent of those who exceed the mean

25	per cent should fall between 118.36 cm. and 122.06 cm.
16.2	" " " " 122.06 " " 125.76 "
6.7	" " " " 125.76 " " 129.46 "
1.8	" " " " 129.46 " " 133.26 "

and 0.3 should exceed 133.26 cm., while the remaining 50 per cent should deviate from the mean in a precisely similar manner, but in an opposite direction.

The method admits of still another application. It is evident that in the series just given 122.06 cm. is the height of a girl who is taller than 75 per cent of the girls of her age, and not so tall as the remaining 25 per cent. Her position is thus definitely fixed with relation to the mean. She is in fact the *typus* or mean of the 50 per cent who exceed the mean of the whole number. The height of such an individual at any age would equal $M+d$, where M is the mean height of the age, and d the probable deviation. The values of $M+d$ determined for each age in the period of growth are comparable, and reveal the growth of the *typus* of the 50 per cent who exceed the mean of the whole number at each age. The growth of the *typus* of the 50 per cent who fall below the mean height can be similarly made plain, and, by continuing the process, the law of growth at any given deviation from the mean can be determined.

The data for these studies can be collected either by the "generalizing" or "individualizing" plan. In the former, a great number of measurements is made but once on individuals of different ages, and the measurements classified according to age. In the latter, the same individuals are measured yearly, or oftener, during their period of growth, and the measurements classified also by age. The generalizing method is rapidly and easily carried out, whereas the individualizing method demands for its execution exceptional opportunities and exceptional patience, requiring not only

that the measurements be made and the records kept through two decades, but that the number of children measured in the early years of this long period be very great, lest death and desertion so thin their ranks that those remaining to the end shall be too few to yield reliable conclusions. Both methods, when applied to the same material, give identical results with regard to means, including those of subdivisions as well as those of the whole number of observations at any age. The individualizing method does more.

The importance of the individualizing method has been much emphasized, for the reason that it can give information without which the laws derived from means cannot, in the present state of knowledge, be applied to individuals. Before this application can be made it is necessary to know the degree of probability that an individual who at a given age stands at a certain deviation from the mean of any dimension will show the same deviation at other ages; for example, the degree of probability that a girl whose height at age 8 is 122.06 cm., and who therefore deviates 3.7 cm., or $+d$ from the mean (118.36 cm.) of her age, will deviate to the same degree ($+d$) from the mean height throughout her growth. In that case the law of growth for the typus at a deviation of $+d$ from the mean is her law of growth. Otherwise she is an exception, and practical regulations deduced from the law for the typus cannot be safely made binding on her. This knowledge, as has just been said, is furnished by the individualizing method, while the generalizing method is of no assistance in this matter.

The application to individuals of the law of growth of the mean is a subject of immediate practical interest. The connection between theory and practical affairs is here unusually short and clear. Were this application possible, the deviations of children from the laws of normal growth could be quickly recognized, and by timely treatment largely overcome, the evil effects of over-study could be watched and intelligently combated, and systems of education, no longer

exacting from all that which should be exacted only from the mean, could be rationally adapted to the special needs of the exceptionally weak and the exceptionally strong. These beneficent reforms, it is at present believed, must await the slow collection of data by the individualizing method. If it is indeed true that the laws of growth determined for the mean cannot be used for the individual until the individualizing method has established the probability of each individual deviation remaining constant throughout the period of growth, then a generation must elapse — so slow is the gathering of data by this method — before the necessary knowledge is in our hands. I hope to show that this long waiting is unnecessary, and that the data collected by the generalizing method may be used, in a way hitherto unrecognized, for the making of standards by which the deviation of an individual from the mean of his age can be seen to be normal or abnormal.

Let the problem be clearly understood. The question is: This boy or girl is above or below the mean height, or weight, etc. of his or her age,— how shall it be known that this deviation is normal or abnormal? There has been hitherto no satisfactory reply to this question. A vague and partial answer is possible after two measurements separated by at least a year's interval. If the deviation is the same, or very nearly the same, at both measurements, the probability is that the child is growing normally. This probability is greater than the general probability that a normal deviation is more likely to occur than an abnormal one, but its numerical value is wholly unknown. If, on the other hand, the two deviations are unequal, the probability is that the greater of them is abnormal, but the numerical value is here also unknown. How definitely the individualizing method could answer this question is difficult of conjecture, in the present lack of data, but certainly no answer whatever could be expected until after two measurements separated by a year's interval,— a year in which the unchecked cause of an abnormal deviation

might inflict irreparable damage on the organism. Such indefinite and fragmentary knowledge can never be the basis of a practical reform. Any solution of this problem which shall gain general acceptance must be easy to understand and easy to apply, and must give the probable degree of abnormality of any observed deviation. These conditions are, I believe, fulfilled by the following method.

According to the theory of probabilities the heights of a thousand individuals of the same class will arrange themselves as follows:—

	$+ n d$	3
	$+ 4 d$	18
	$+ 3 d$	67
	$+ 2 d$	162
	$+ d$	250
[Where M = the mean, and d = the probable deviation]	M	—
	$- d$	250
	$- 2 d$	162
	$- 3 d$	67
	$- 4 d$	18
	$- n d$	3

Let these be divided into seven groups:—

I.	All individuals between	$+ n d$	and	$3 d$	21
II.	"	"	"	$+ 3 d$	" 2 d 67
III.	"	"	"	$+ 2 d$	" $+ d$ 162
IV.	"	"	"	M	" $+ d$ 500
V.	"	"	"	$- d$	" $- 2 d$ 162
VI.	"	"	"	$- 2 d$	" $- 3 d$ 67
VII.	"	"	"	$- 3 d$	" $- n d$ 21

The mean height, weight, girth of chest, etc. of each of these groups at any given age will be the typus of a certain degree of deviation from the mean of the age,—that is to say, the heights, weights, etc. of each group will be symmetrically distributed above and below the mean height, weight, etc. of the group in the manner already illustrated for the entire undivided number of observations, *i. e.*, the entire

thousand. Each group, therefore, will be characterized by a physical development definitely determined by the means of height, weight, and other physical dimensions. These means taken together form the *typus* or norm of the group. The individual deviations from this norm follow the theory of probability, and the degree of abnormality presented by any individual deviation can be expressed in the terms of this theory. An example will illustrate this: A boy x shows a deviation in height of $+1,5d$ from the mean height of his age; he falls therefore in group III. The boys in this group possess a mean weight of M^1 kilog., with a probable deviation of $+d^1$, that is, boys from d to $2d$ taller than the norm of their age should weigh $M^1 + d^1$ kilog. In like manner they should possess a girth of chest of $M^2 + d^2$ centimetres, and a span of arms of $M^3 + d^3$ cm., and so on. If the weight, etc. of the boy x coincide with the means of his group (group III) his physique is normal, the accuracy of this conclusion being proportionate to the number of different measurements on which it is based. If the boy x deviate more than $\pm d$ from the mean in one or more dimensions his development is abnormal, and the degree of abnormality is measured by the amount of his deviation.

The necessity of choosing some one dimension as a basis of such a system of measurement is self-evident. There are good reasons, partly theoretical and partly practical, why height rather than weight should be taken as a basis. Height is more stable, less liable to irrelevant fluctuations than weight. An excess in weight can be reduced; a child whose weight is out of proportion to its height may be brought into proportion by suitable diet and exercise; but height once attained cannot be reduced, nor can the growth in height be easily influenced. Practically, therefore, the physical trainer must be content to bring the weight, girth of chest, strength of squeeze, and other physical dimensions up to the mean development which corresponds to the height of the child. Experience has abundantly shown that the relation of weight

to height is of great importance to health, life insurance companies declining to receive applicants whose weight falls much below the standard weight of their height. For these reasons height should be preferred as the basis of the system.

The question whether any given deviation is normal or abnormal is answered by this system in two ways: in respect of height, by the degree of deviation from the mean or norm of the whole number of observations; in respect of other dimensions, by the degree of deviation of the weight, girth of chest, etc. from the mean weight or girth of chest corresponding to the height of the individual under examination, this normal weight, etc. being determined with sufficient exactness by taking the means and probable deviations of the group in which the height falls. It is evident that all cases included within $M \pm d$ must be termed normal, for the chances are even that any individual measurement in a series will fall within $M \pm d$, and are against its exceeding these limits, being 4.64 against 1 that it will fall at $M \pm 2d$.

Strictly speaking, all abnormal deviations in any dimension are probably unhealthful, yet an important difference exists in this respect between abnormal deviations in height and abnormal deviations in weight, girth of chest, etc. as related to height. It cannot be doubted that abnormal height is probably (using the word in its technical sense) a disadvantage. The potential energy of the body is converted into mechanical labor and heat, by far the greater expenditure taking the latter form. In the adult the total expenditure in the form of heat is about 2700 calories in 24 hours (Helmholtz), of which 80.1 per cent escape in radiation, conduction, and evaporation from the skin. Thus the superficies of the body plays a great part in the dissipation of energy. The superficies is greater usually in tall children than in short, a difference of special importance in the young, in whom metabolism is much more active than in the adult. More heat is therefore lost by the abnormally tall than by those of normal height. There is a disadvantage also in the loss by mechan-

ical labor. Greater height entails increased work on the heart and on the skeletal muscles. In short, increased loss of energy goes hand in hand with increase in height. Hence in the tall the necessity of a physical development which shall be so much above the mean as to compensate their greater loss of energy. In growing children not only must there be compensation for the expenditure of energy, but there must be energy stored in the increase of tissue which constitutes growth.

If the greater demands of tall children are balanced by a correspondingly greater income of energy, a normal equilibrium or "health" is preserved. It should be clearly recognized that this equilibrium is unaffected by the absolute height, and is dependent only on the relation between height and the other physical dimensions. Consequently, health is as possible in tall children as in those of normal height, although less probable, for the chances against a compensatory development of weight and other dimensions increase very rapidly with the deviation of the height from the norm. The absolute height of an individual is, therefore, of very secondary interest from a practical point of view, because it is not necessarily a state of ill health, whereas the development of weight, girth of chest, etc. in proportion to height is of supreme interest. The lack of proportion between height and other physical dimensions is itself ill health. The tendency of organisms to adapt ends to means is strong, and an imperfect compensation may suffice for most demands. A heart in which an hypertrophy of the left ventricle has partially compensated an insufficiency of the mitral valve may beat regularly enough for ordinary exertions, and yet fail utterly when its possessor is forced to suddenly ascend a height, or to make any other unusual exertion. So a tall child may have a sufficient income of energy to meet the demands of a wisely regulated life, and sink under the burden of unusual tasks.

It has been shown in the foregoing pages that the means derived from anthropometrical measurements by the generalizing method can be used to determine whether the weight and other physical dimensions of an individual are normal in relation to height, and it has been pointed out that this normal relation constitutes the health of the individual. It follows that the normal amount of labor cannot be exacted without injury from those in whom this normal equilibrium is wanting. These facts must therefore be taken into account in a rational school system, and it should now be made plain how this is to be done.

II.

All systems of education have for their object the largest possible development of individual minds. In large schools the tasks by which this development is promoted are those which secure from the child of mean ability its maximum mental output. In practice they are determined by examinations. Hence the existence in every educational institution of classes or grades based on the mental output of the mean pupil, and related to age only in that the output fixed as the standard of any class is necessarily found more often at a certain age than at other ages. Thus there exists a mean age for each class, the greater number of pupils at any age being found in the same class, while some have advanced beyond, and others, equally old, have not yet come so far as this class.

On an average, those who have advanced beyond the greater number of their age are precocious, that is, possess more than the mean capacity for mental labor, while those who are less advanced are dull, possessing less than the mean capacity. It has been demonstrated that there is a physical basis for precocity and dullness.* When numbers sufficiently large for safe statistical work are employed, it is seen that precocious pupils possess a greater mean weight, height, etc. than the mean pupils, and that the latter are heavier and

* W. Townsend Porter, *loc. cit.*

taller than the dull. The mental output is therefore directly related to the physical condition of the pupils. The mean height, weight, girth of chest, etc. in any grade is the mean physical development corresponding to the mental output of the grade. It follows that those who do not possess this development cannot, without abnormal strain, do the work exacted in this grade. On the other hand, pupils who possess more than the mean physical development of their age should be capable of more than the mean labor. Yet the management of this latter class presents but few difficulties, whereas the former class cannot be too carefully protected.

The consequences of continued overstrain in a growing boy or girl are most unhappy. The curves of growth in height and weight of the mean child are characteristic. The quick rise to age 7 or 8, the slower ascent to age 11 in girls and 13 in boys, the remarkable three years of accelerated development preceding puberty, and, finally, the rapid decrease in the rate of growth as full development approaches express the normal development of the type, and, presumably, the normal development of the individual. Overwork may cause a temporary or a permanent deviation in these curves. It is probable, though not certain, that a temporary loss, consequent on a slight overstrain, may not lower the final outcome of the development, but there can be no doubt as to the result of a prolonged strain. In such a case, the probability is strong that the whole subsequent curve will be turned out of its course. A prolonged strain in a growing child harms for life, and leaves a mark which can never be effaced. The danger is greatest in the periods of quickest development, particularly great in the prepubertal period. It is a sufficient commentary on the evils of the present educational methods that during these very years the indiscriminating routine of a system devised for the average pupil is most inflexibly applied to weak and strong alike.

Overstrain can often be recognized both by subjective and objective symptoms. Subjective symptoms, however, are

frequently obtained with difficulty, especially in pupils who are unusually ambitious, and who over-study from choice. An objective symptom is therefore necessary,—a symptom easily demonstrated and almost never wanting. Such a symptom is the failure to gain weight at the normal rate. A persistent loss of weight in an adult is regarded as a matter of grave concern; the persistent failure of a child to make the normal gain in weight is no less grave. It is not pretended that the failure to gain weight always accompanies overstrain, but it is claimed that the number of exceptions is small, and that frequent weighing is the most practical and, in the whole, the most certain method of detecting the presence of influences that are working injury to the development of the child. The skillful breeder of cattle depends on systematic weighing to inform him whether his efforts to secure well-developed animals are meeting with success, but children are left to grow at hap-hazard.

It is not enough that overstrain should be recognized by the harm it has done. The child should be guarded against the possibility of harm. The anthropometrical system proposed in this article offers a means of doing this. It infallibly discovers those whose physical development is below the standard of their age. It no less certainly indicates the physical development which most often accompanies the power to do the mental work of any grade. It therefore divides the pupils into two bodies, those physically competent and those physically incompetent for a clearly defined degree of mental exertion. When working with great numbers, the infallibility of this system is practically absolute and theoretically almost absolute. When applied to individuals, errors will certainly occur, but the number of errors will, according to the laws of probability, be less than the number of correct conclusions. And these errors cannot influence the great fact that such a system is competent to call attention to the children who shall probably be unable to do the normal work of their age without injury. Each individual case must then be treated on its own merits.

The proposed system of physical examination requires—

I. The collection of sufficiently extensive data by the generalizing method.

II. The determination of the means and the probable deviations of height, weight, girth of chest, strength of squeeze, etc. for each age.

III. The division of the individuals at each age into groups in terms of the probable deviation from the mean height, as, illustrated above, and the calculation of the mean and probable deviation of the weight, girth of chest, etc. of each group.

IV. The determination of the mean physical development of the pupils in each class or grade of the school system.

V. The physical examination of each applicant for entrance to any grade.

These data permit the enforcement of the following regulation: No pupil whose physical development deviates more than $\pm d$ from the weight, etc. of the mean pupil of his height in a class which his mental output would otherwise entitle him to enter shall be admitted to that class unless with the approval of a medical expert, if possible a regularly appointed school physician, who shall testify that the pupil's strength shall be equal to the strain.

ANTHROPOMETRIC STATISTICS OF AMHERST COLLEGE.

BY EDWARD HITCHCOCK, M.D.

When the Department of Hygiene and Physical Education was established in Amherst College, about thirty years ago, one of the very first things accomplished was the securing of bodily measurements and tests of every student as he entered the college, and again at intervals. This has been kept up with increasing accuracy and enlargement, and is still an important feature of the department. It has been the habit of the department to furnish at many of the public occasions of the college, along with the schedule of the exercises, some anthropometric and other closely connected statistical details in a printed form.

The first work to be mentioned is the result of five years' record of the measures of all the students of college, in eight items of inquiry, from 1861 to 1865. These averages were :

Age, 21 years and 4 months.	
Weight, without clothes,	137.9 pounds.
Height,	67.8 inches.
Chest girth, without clothes, . . .	35.3 "
Arm girth,	11.3 "
Forearm girth,	10.9 "
Capacity of Lungs,	237.2 cubic inches.
Measure of strength,	11.3

During the same five years the *sickness of college students* as averaged to each man, and to the four classes, was recorded. In this study each man in college lost 2.34 days of the year from sickness or accident, a man being regarded as "sick" who was absent three or more consecutive days from all college exercises.

The number of individuals who were sick during this period, giving the average of each class, was found to be : —

Seniors,	5.6 men.
Juniors,	7.0 “
Sophomores,	10.8 “
Freshmen,	12.8 “

showing that health increased during the college course.

Some items were gathered in a study of ten years, by classes, with reference to sickness, as before mentioned, and the results were as follows : —

Seniors, averaging 50.0 men, had	6.6 on the sick list.
Juniors, “ 53.2 “ “	9.1 “ “ “ “
Sophomores, “ 62.9 “ “	12.6 “ “ “ “
Freshmen, “ 64.1 “ “	14.9 “ “ “ “

And in this same period the average loss of time to each sick man was 11.4 days, and to all the college of 2.1 days. There also were among these men 43 different maladies, of which 33 per cent were colds and 9 per cent physical accidents and injuries.

Still later, statistics of 14 years' duration for 3488 students were compiled, and the following law seemed to be deducible: The rate of difference in numbers between freshmen and sophomores was 6 per cent, and the decrease in sickness 15 per cent. Between the sophomore and junior classes the numerical difference was 14 per cent, and the decrease in sickness 17 per cent. The falling off in numbers from junior to senior years was 8 per cent, and the sickness decreased to the amount of 30 per cent.

A study of the viability of the first 39 classes of the college — 1821 to 1860 — on the living condition of these graduates has also been a matter of study. The average viability was 84 per cent, or 16 per cent mortality in classes, averaging at their graduation 24 years of age.

Another study during 1874 was (see *Table A*, p. 590) —

Table A.

Some of the Anatomical and Physiological "Constants" of a student of Amherst College. Determined by 4311 observations recorded during the past thirteen years, with the relative percentage of the different classes, the Freshman as the unit of comparison.

	Age in Years.	Relative per Cent.	Weight in Pounds.	Relative per Cent.	Height in Feet.	Relative per Cent.	Chest Girth in Inches.	Relative per Cent.	Arm Measure in Inches.	Relative per Cent.	Forearm Measure in Inches.	Relative per Cent.	Utmost Lung Capacity in Cubic Inches.	Relative per Cent.	Test of Strength.	Relative per Cent.	Relative Class Percentage.
Seniors.....	22.403	1.164	142.238	1.067	5.681	1.016	36.755	1.014	11.716	1.033	11.141	1.020	259.610	1.063	11.427	1.201	1.076
Juniors.....	21.941	1.140	141.562	1.062	5.682	1.016	36.006	1.022	11.676	1.029	11.060	1.013	264.341	1.071	11.411	1.200	1.069
Sophomores....	20.700	1.075	138.396	1.038	5.663	1.013	36.107	1.025	11.638	1.025	11.062	1.013	256.222	1.060	10.700	1.125	1.061
Freshmen.....	19.248	1.000	133.331	1.000	5.590	1.000	35.236	1.000	11.351	1.000	10.920	1.000	237.445	1.000	9.512	1.000	1.000
All.....	21.073	1.095	136.879	1.042	5.654	1.011	35.776	1.015	11.595	1.021	11.045	1.011	251.904	1.061	10.512	1.105	1.049

In 1879 the average and mean measurements of 1262 students, attending between 1861 and 1878, were contrasted in respect to six items. The contrasts are here shown. The average age was 21 years and three months.

	Mean.	Average.
Weight in pounds,	127	139
Height in inches,	67	66
Chest girth in inches,	36	36
Arm " " "	11	12
Lung capacity in cubic inches,	220	250
Pull up, number of times,	12	11

26,060 measures of 1321 students of the six items below gave strength to the belief that the body gains its physical perfection between 26 and 30 years of age.

It is generally accepted as a law that bodily growth continues until the age of 30. This law, however, is not verified by these statistics when studied by the single years of observation, owing probably to an insufficient number of data, and specially above the age of 24. But on grouping the years thus: All under 20; all from 20 to 24, inclusive; and all from 25 to 29, inclusive, there is a very close illustration of the general law, as is seen by this table.

Age.	Weight.	Height.	Chest Girth.	Arm Girth.	Lung Capacity.	Body Lift.
Under 20	133.50	66.20	34.75	11.33	233.85	9.88
20 to 24	140.28	68.12	36.25	11.73	254.23	10.68
25 to 29	143.40	68.48	36.85	11.69	264.66	10.64

See *Table B* on page 592.

After 20 years of gathering and recording anthropometric statistics of our students several tables were compiled relating to physical measures, growth and development, the sick list, and the maladies. These are here inserted.

See *Table C* on page 593.

Table B.

The average results of the measures of the weight, height, chest, arm, lung capacity, and body lift of 1321 different students of Amherst College during the years 1861-62 to 1877-78, inclusive.

Age in Years.	Number.	Weight in Pounds.	Height in Inches.	Chest in Inches.	Arm in Inches.	Lung Capacity in Cubic Inches.	Number.	Times Lifted.	Total Numbers.
17	42	131.821	66.156	33.947	11.131	220.27	42	8.47	280
18	573	133.250	66.596	35.019	11.353	237.31	551	10.35	3,414
19	761	135.440	67.068	36.397	11.514	243.96	715	10.83	4,470
20	759	138.106	67.800	36.723	11.564	249.52	726	10.54	4,519
21	722	139.529	67.716	36.748	11.828	249.93	697	10.73	4,306
22	523	140.852	68.148	36.109	11.819	263.65	496	10.98	3,106
23	392	140.680	68.290	36.330	11.901	266.83	360	10.73	2,298
24	258	142.249	68.676	37.365	11.794	261.22	247	10.44	1,536
25	144	145.029	68.832	38.025	11.777	264.15	140	10.01	869
26	106	144.261	68.436	38.528	11.780	262.63	96	10.50	624
27	57	143.911	68.316	36.923	11.851	266.20	54	10.53	338
28	27	141.129	68.664	36.374	11.574	269.79	24	12.31	158
29	19	142.684	68.076	36.415	11.513	260.52	19	9.86	110
30	18	146.500	69.192	36.705	11.611	279.65	17	7.50	101
	4,381						4,184		28,040
							4,381		
							4,262		

Table C.—Measures of 2106 different students of Amherst College, showing the Averages of each class for twenty years, in Age, Weight, Height, Chest Girth, Arm Girth, Forearm Girth, Lung Capacity, Body Lift, Finger Reach, Chest Expansion, and the Comparative Right and Left Hand Strength.

	Number Observed.	Age.	Weight.	Height.	Chest Girth.	Arm Girth.	Forearm Girth.	Lung Capacity.	Body Lift.	Finger Reach.	Chest Expansion.	Right Hand Strength.	Left Hand Strength.	Per Cent Strongest with Right Hand.
Seniors.....	1,113	22.24	142.19	67.94	35.97	11.77	11.21	251.05	11.33	69.72	3.18	92.02	86.48	93
Juniors.....	1,148	21.87	140.59	67.86	35.61	11.72	11.07	250.07	11.31	69.78	3.33	88.99	85.98	97
Sophomores.....	1,263	20.57	139.39	67.53	35.44	11.69	11.06	249.23	10.58	69.70	3.45	90.45	86.05	96
Freshmen.....	1,489	19.31	133.19	67.33	34.76	11.23	10.80	233.08	8.61	69.60	3.00	87.83	83.34	96
College Average	5,013	21.10	138.84	67.66	35.40	11.19	11.02	241.79	10.25	69.69	3.02	89.69	85.50	96
College Mean..	.....	.....	131.00	67.50	35.50	11.25	.....	230.00	11.00	.....	.....	.....	.....	.....

Table D.—Showing the Maxima and Minima of every measurement of the 2106 students observed.

	Age, Years and Months.	Weight in Pounds.	Height in Inches.	Chest Girth in Inches.	Arm Girth in Inches.	Forearm Girth in Inches.	Lung Capacity in Cubic In.	Body Lift.	Finger Reach in Inches.	Chest Range in Inches.
Maxima.....	35.6	216	76.5	43.00	15.5	15.00	426	65	81.10	5.50
Minima... ..	15.3	84	58.0	27.25	8.0	8.25	115	2	48.00	1.50

Table E.—The Mean Observations of the measures of Amherst College students for twenty years, from a total of 84,884.

Weight in Pounds.	Number.	Height in Inches.	Number.	Chest Girth in Inches.	Number.	Arm Girth in Inches.	Number.	Lung Capacity in Cubic Inches.	Number.	No. of Times Body Lifted.	Number.
175	69	72	104	40	61	14.0	44	340	53	21	88
167	106	71	291	39	165	13.5	81	320	94	20	176
159	238	70	385	38	394	13.0	323	300	275	18	372
151	490	69	808	37	704	12.5	602	280	608	16	610
143	798	68	955	36	1,079	12.0	1,117	260	871	14	790
135	1,157	67	986	35	1,164	11.5	1,205	240	1,287	12	940
127	1,198	66	790	34	1,098	11.0	1,245	220	1,275	10	1,075
119	982	65	571	33	682	10.5	658	200	732	8	796
111	487	64	371	32	310	10.0	316	180	379	6	590
103	163	63	208	31	104	9.5	77	160	148	4	302
95	46	62	65	30	41	9.0	17	140	39	2	120
	5,733		5,534		5,812		5,685		5,761		5,859

Table F.—Data of Student Sickness and Physical Disability for nineteen years and nine months in Amherst College.

Students' names on the annual Catalogues, 1861 to 1881, inclusive, 5443.

	Names on An'l Catalogues for 20 Years.	Names on Sick List.	Per Cent of Each Class to Whole College.	Per Cent of Sickness in Each Class to Whole College.
Seniors.....	1,192	260	21.90	19.05
Juniors.....	1,270	319	23.33	23.37
Sophomores.....	1,465	386	26.32	28.28
Freshmen.....	1,516	400	27.85	29.30
	5,443	1,365	100.00	100.00

Students on the sick list, 1,875

Cases (not individuals) of sickness, 1,725

Cases on sick list more than once in the year, 850

Per cent of college on the sick list, 25.26

Table G.—The Maladies of the students, and their proportion, when it equals one or more per cent of the whole. This is the number of cases, not students.

Maladies.	Per Cent.	Maladies.	Per Cent.
Colds, Pneumonia, Bronchitis, etc.	37.4	Liver and bilious.....	2.3
Physical injury.....	8.8	Neuralgia.....	1.8
Febriculae.....	4.8	Malaria.....	1.7
Eyes, weak and sore.....	4.7	Mumps.....	1.7
Quinsy and sore throat.....	4.6	Diphtheritic.....	1.1
Boils.....	4.1	Measles.....	1.1
General inability.....	3.1	Teeth.....	1.1
Typhoid fever.....	3.1	Stomach.....	1.1
Bowels.....	2.6	Overwork.....	1.0

Table H.—The measures of Weight, Height, Chest, Arm Girth, Lung Capacity, and Body Lift of 2106 different students of Amherst College, arranged by age.

Age.	Number of Observations.	Weight.	Height.	Chest.	Arm.	Lung Capacity.	Body Lift.
17	330	131.99	66.60	33.87	11.12	224.8	8.58
18	1,172	134.07	66.96	35.10	11.36	238.7	10.35
19	1,511	135.84	67.30	35.38	11.52	246.3	10.82
20	1,358	138.12	67.95	35.52	11.57	248.8	10.97
21	1,171	140.00	68.01	35.58	11.69	250.1	10.84
22	807	141.07	68.11	35.96	11.77	250.8	10.92
23	559	141.21	68.31	36.29	11.71	257.0	10.63
24	362	142.42	68.44	37.23	11.74	261.0	10.62
25	216	145.12	68.68	36.66	11.79	263.6	10.11
26	141	144.91	68.82	37.46	11.81	262.5	10.71
27	71	144.40	68.30	36.95	11.84	268.4	10.37
28	30	140.71	68.52	36.28	11.57	269.8	8.51
29	19	142.68	68.09	36.41	11.51	260.5	9.86
30	18	146.50	69.19	36.70	11.61	279.5	7.50

Table I.— Giving the measures of 749 students of Amherst College at two intervals of three years and six months, and at an average age of 19 years and two months at the first observation, showing their physical development during this period.

Number of <i>men</i> measured,	749	Per Cent.
“ “ increased in all items,	196	26.15
“ “ decreased in some items,	401	53.40
“ “ both same and increased items,	355	47.39
“ “ both same and decreased items,	211	28.17
Number of <i>items</i> secured,	5,160	
“ “ showing increase,	3,972	76.97
“ “ same Freshman and Senior year,	487	9.43
“ “ less in Senior year,	701	13.58

	Weight. Pounds.	Height. Inches.	Chest. Inches.	Arm. Inches.	Forearm. Inches.	Lung Capacity. Cubic in.	Body Lift.
Greatest individual gain...	56.00	6.00	6.50	4.000	3.500	1.34	25.00
Averages of increased men	12.27	1.05	1.45	0.853	0.685	28.40	4.50
Per cent of decreased items	11.00	....	20.31	13.460	25.270	14.64	20.13

Some statistics have been gathered showing the differences between the “average” and the “mean.”

Sir John Herschel has said “an average may exist of the most different subjects, as the height of houses in a town, or the size of books in a library. It may be convenient to convey a general notion of things, but it involves no conception of a natural and recognizable central magnitude, all differences from which ought to be regarded as deviations from a standard. The notion of a mean, on the other hand, does imply such a conception standing distinguished from an average by this feature, namely, the regular march of the groups, increasing to a maximum, and then again diminishing. An average gives us no assurance that the future will be like the past; a mean may be reckoned on with the most implicit confidence.”

Table J.—Showing the average and mean measurements, in respect to six items, of 2106 students between 15 years and 3 months and 35 years and 6 months of age, with an average age of 21 years and 1 month.

Weight, . .	138.84 lbs.	=	63.00 k.	131.00 lbs.	=	59.40 k.
Height, . .	67.56 lbs.	=	1.72 m.	67.34 in.	=	1.71 m.
Chest girth, .	35.40 in.	=	89.90 c.m.	35.50 in.	=	90.00 m.
Arm girth, .	11.02 in.	=	27.99 c.m.	11.25 in.	=	28.57 c.m.
Lung capacity,	241.70 cu. in.	=	3960.70 c.c.	230 cu. in.	=	3769.40 c.c.
Body lift, . .	10.25 times.			11 times.		

A study was made showing the relation of the trunk, the arm reach, and the horizontal length of the body.

The results given below (*Table K*) were secured from measurements of 327 students, the whole college numbering 340. The measurements were taken during March and April, 1882, and the average age of all men measured was 21 years and six months.

One of the objects to be gained from this work is to learn the relation between the length of the cerebro-spinal column, the perpendicular height of the body, its length when extended horizontally, and the distance between the tips of the middle fingers when the arms are fully extended.

Medical Director Ruschenberger of the U. S. Army says: "It seems probable that the length of the cerebro-spinal column may be a more valuable element in estimating the physical qualifications of a recruit than total stature. Observation has led me to conjecture that as a rule men of average height, made up of a long trunk and comparatively short lower extremities, possess greater power to endure with impunity great labor and exposure to vicissitudes of all kinds than men who have comparatively long lower limbs and short trunk."

The relative measurements of these portions of body have been made, and the results are seen in the appended table. And these results are given by class averages, and by averages of the aggregate students, which are expressed both in the metric and in the English system.

The finger reach is 1.787 metres, or 70.355 inches.

The horizontal length is . . 1.748 " " 68.820 "

The perpendicular height is . 1.729 " " 68.071 "

The sitting height is 907 millimetres or 35.709 "

We seem, then, to learn from these statistics that a college student, as expressed by an Amherst average, may expect to give a trunk measurement proportioned to his total height of 1.1906. This is a difference of 822 millimetres, or about 32 inches, and the trunk is more than half the total height of the body. The difference in length between the body lying down and the body standing erect is 19 millimetres, or about three-quarters of an inch, in favor of the horizontal measure. The measure of the tips of the fingers exceeds the total height by 39 millimetres, or about one and one-half inches.

Table K.

	Number of Men.	Finger Reach.	Horizontal Length.	Height of Whole Body.	Sitting Height.
Seniors.....	64	1.805	1.776	1.773	910
Juniors.....	95	1.787	1.763	1.739	919
Sophomores.....	79	1.779	1.727	1.716	902
Freshmen.....	89	1.777	1.725	1.689	897
Average.....	.....	1.787	1.748	1.729	907

See Table L on page 598.

Up to nearly this time, 1882, our statistical work had been directed very much to averages, means, development, and growth. But all along the thought had been pressing itself forward that there is some standard by which to estimate the proper growth and development of the student; or at least we must have some method to work by advisedly. It was perhaps well enough for the average, the mean, the 50 per cent man, but what can we do for all the others? The thought of the *Stature or Bodily Height* seemed a desirable field to work in, and accordingly the whole effort was devoted to *arranging all the measurements in groups of heights running one centimetre each*. The first table of this descrip-

Table L.

Measures of the Weight, Height, Chest Girth, Arm Girth, Lung Capacity, and Pull Up of the students of Amherst College, gathered between the academic years of 1861-62 and 1884-85, inclusive, noted in the English and in the *Metric* system. Arranged and averaged by Age, and of 7988 individuals.

Age of the Students.	Number of Students Measured at Each Year.	Weight in Pounds and Decimals.	Weight in Kilos and Tenths.	Height in Inches and Hundredths.	Height in Metres and Millimetres.	Chest Girth in Inches and Hundredths.	Chest Girth in Milli-metres.	Arm Girth in Inches and Hundredths.	Arm Girth in Milli-metres.	Lung Capacity in Cubic Inches.	Lung Capacity in Litres.	Pull Up. Number of Times.
16	20	123.42	56.1	66.70	1.695	34.20	868	10.60	268	225.0	3.68	8.08
17	390	128.73	58.5	66.77	1.697	34.23	870	11.06	280	229.0	3.80	9.42
18	1,338	131.09	59.6	66.96	1.700	35.42	895	11.23	285	239.3	3.97	10.06
19	1,453	133.13	60.5	67.12	1.709	35.43	896	11.40	290	244.1	4.02	10.18
20	1,478	134.09	61.3	67.47	1.714	35.63	905	11.58	295	250.4	4.11	10.17
21	1,351	136.37	61.9	67.60	1.716	35.92	918	11.65	298	254.0	4.18	10.26
22	867	137.61	62.5	67.58	1.720	36.29	926	11.74	300	256.0	4.20	10.26
23	590	138.95	63.1	67.70	1.721	36.75	944	11.94	303	260.5	4.28	10.28
24	384	140.33	63.8	67.77	1.722	37.36	940	11.96	304	263.0	4.30	10.26
25	337	142.34	64.7	67.90	1.726	37.40	947	11.98	305	265.0	4.36	10.27

tion was made in 1884 from the height of 155 to 183 centimetres of 51 items of measurement from 628 men. Then each man as he was measured, with his record in his own hands, could see his exact relation to the average man of his own height, as determined by the records for many years past.

From this table were constructed cards—one for each centimetre—of the heights already mentioned, and containing the records of the 51 items observed, and side by side of his own record of measures. And upon this same card were given the directions and suggestions of the examiner, when there was a special lack of development, and one with the average of all college for work and development. Besides this it contained the directions for taking the measurements as adopted by the American Association for the Advancement of Physical Education, the method of examining the eyes and ears, and general directions for the use of the development apparatus in the gymnasium.

Two years later another edition of the manual was issued, and today, 1893, a third one is just from the press, with enlarged tables and data, but all tending to confirm the idea that stature is the foundation upon which the idea of the typical student should be constructed, and the source from which all corrections for imperfect or non-development should be made.

It is most interesting to note that the statue of the typical college student exhibited at the Chicago Exposition today most strongly exemplifies this idea.

To conclude, the results of Anthropometry in Amherst College as they stand today are to be found in the tables accompanying this paper, and in the revised tables contained in the third edition of the *Anthropometric Manual of Amherst College, 1893*.

AN ANTHROPOMETRICAL STUDY OF THE EFFECTS OF GYMNASTIC TRAINING ON AMERICAN WOMEN.

BY CLAES J. ENEBUSKE, A.M., PH.D.,

PRINCIPAL OF INSTRUCTION IN THE BOSTON NORMAL SCHOOL OF GYMNASTICS.

In order to trace the results of gymnastic training, the students of the Boston Normal School of Gymnastics are measured at regular intervals during the school year. The first measurements are taken at the beginning of the school work in the autumn; the last measurements are taken at the close of the school in the spring. At the beginning of each month those items which are most susceptible to change under the influence of the training are remeasured, and the change in which has most direct influence upon the working capacity and resistive power of the student, so far as is manifest in gymnasium work. The measures taken each month are the weight, lung capacity, strength of legs, back, chest, left and right forearm. At the beginning and close of the work 53 different measurements are taken in all, namely, the standing height, the length, breadth, depth, girth of various parts of the body, taken at distinct anatomical landmarks. Besides these a series of tracings of the form of the chest are taken at the beginning and close of the year. These are made by means of the anthropometric machines, constructed for this purpose by Démeny in Paris. They consist of, 1st, tracing of thorax in horizontal section, with chest in inspiratory — repose — and expiratory position; 2nd, tracing of the median profile of the trunk with chest in inspiratory, repose, and expiratory position; 3rd, the antero-posterior curve of the back; 4th, the mid spinal line.

In the present paper we wish to present a part of the results attained by the study of the measurements of *one hundred junior students of the school*.* The first observation

* The measurements have been made by Miss M. Anna Wood, of Wellesley College, and Miss Margaret S. Wallace, of the Boston Normal School of Gymnastics.

was made before the training began, or in the early part of the training; the second observation was made seven months later. During the intervening period, *i. e.*, from October to May, the students had one hour's gymnastic training five days a-week, besides attending the required lectures and recitations. The ages of the students range from seventeen to forty-two years. The distribution of age at the beginning of the training is shown in the following table:—

TABLE I. AGE AT THE FOLLOWING PERCENTILE GRADES.

Percentile Grade.	5.	10.	20.	30.	40.	50.	60.	70.	80.	90.	95.
Years.....	19	19½	20½	21	22	23½	25½	27	30	35	37

Height. The highest and lowest statures of these 100 students were 171.3 and 147 centimetres, respectively. Table II shows the distribution of height before and after the training.

TABLE II. HEIGHT.

Percentile Grade.	5.	10.	20.	30.	40.	50.	60.	70.	80.	90.	95.	Unit.
Before the training.....	151.3	152.8	154.9	156.6	158.6	160.1	160.7	162.7	164.8	167.5	169.5	Centimetre.
After 7 months' training.....	152.0	153.0	155.0	156.8	158.8	160.2	161.5	163.2	166.5	167.6	169.6	

Weight. The highest and lowest weights observed in these cases are, before the training, 74.3 and 40.2 kilos., respectively; after the training, 72.9 and 38.4 kilos., respectively. Table III shows the value of the following percentile grades before and after training:—

TABLE III. WEIGHT.

Percentile Grade.	5.	10.	20.	30.	40.	50.	60.	70.	80.	90.	95.	Unit.
Before the training.....	43.5	45.0	47.5	49.5	51.5	53.4	55.0	57.5	59.7	63.1	65.8	Kilos.
After 7 months' training.....	43.5	44.8	47.1	49.1	51.7	53.3	55.2	57.3	59.4	62.1	66.4	

It will be seen that a slight diminution in weight has taken place generally (the exceptions being at the 40, 60, and 95 per cent grades).

Lung Capacity. The highest and lowest lung capacity observed in these cases are, before the training, 3.76 and 1.31 litres, respectively; after the training, 4.1 and 1.97 litres, respectively. Table IV shows the value of the following percentile grades:—

TABLE IV. LUNG CAPACITY.

Percentile Grade.	5.	10.	20.	30.	40.	50.	60.	70.	80.	90.	95.	Unit.
Before the training.....	2.13	2.27	2.40	2.46	2.56	2.65	2.75	2.87	2.95	3.07	3.35	Litre.
After 7 months' training.....	2.27	2.38	2.54	2.65	2.72	2.87	2.96	3.03	3.12	3.29	3.43	

It is seen that increase of lung capacity has taken place at all the percentile grades. After seven months' gymnastic training the value of the 30 per cent grade (2.65) is equal to the value at the 50 per cent grade before the training, and the value at the 50 per cent grade after the training (2.87) is equal to the 70 per cent grade before the training.

Strength of Legs. The extreme values observed are, before the training, 148 and 60 kilos., respectively; after the training, 190 and 81 kilos., respectively. Table V gives the value of the following percentile grades:—

TABLE V. STRENGTH OF LEGS.

Percentile Grade.	5.	10.	20.	30.	40.	50.	60.	70.	80.	90.	95.	Unit.
Before the training.....	68.0	70.0	78.0	80.0	88.0	93.0	100.0	105.0	119.5	131.5	139.5	Kilos.
After 7 months' training.....	87.5	94.5	100.0	108.5	115.0	120.0	127.5	135.0	145.0	160.0	168.5	

Increase has taken place at all the percentile grades. After the training the value at the 10 per cent grade (94.5) is higher than the value of the 50 per cent grade before the

training (98), and the 50 per cent value after the training (120) is higher than the 80 per cent value before the training (119.5).

Strength of Back. The extreme values were, before the training, 100 and 40 kilos., respectively; after the training, 124 and 48 kilos., respectively. Table VI shows the value of the following percentile grades:—

TABLE VI. STRENGTH OF BACK.

Percentile Grade.	5.	10.	20.	30.	40.	50.	60.	70.	80.	90.	95.	Unit.
Before the training.....	45.5	49.0	52.5	57.5	60.5	65.5	70.0	75.0	80.5	90.0	91.5	Kilos.
After 7 months' training.....	60.0	66.0	72.0	77.0	78.0	81.5	86.0	91.5	95.0	100.0	104.0	

Increase has taken place in all the grades. The 10 per cent value after the training (66) is higher than the 50 per cent value before the training (65.5), while the 50 per cent value after the training (81.5) is higher than the 80 per cent value before the training (80.5), and the 70 per cent value after the training (91.5) is equal to the 95 per cent value before the training.

Strength of Chest. The extreme values before the training were 37 and 15 kilos., respectively; after the training, 48 and 18 kilos., respectively. Table VII shows the value of the following percentile grades:—

TABLE VII. STRENGTH OF CHEST.

Percentile Grade.	5.	10.	20.	30.	40.	50.	60.	70.	80.	90.	95.	Unit.
Before the training.....	19.0	20.5	24.0	25.0	26.0	27.0	28.0	29.0	30.3	32.8	34.0	Kilos.
After 7 months' training.....	24.5	26.8	28.5	29.8	31.0	32.0	33.0	35.0	36.5	39.0	39.0	

Increase has taken place in all the grades. The 10 per cent value after the training (26.8) is slightly below the 50 per cent value before the training (27), while the 50 per cent

value after the training (32) is higher than the 80 per cent value before the training (30.8), and nearer the 90 per cent value (32.8) before the training.

Strength of Right Forearm. The extreme values were, before the training, 36 and 10 kilos., respectively; after the training, 39 and 19, respectively. Table VIII gives the value of the following percentile grades:—

TABLE VIII. STRENGTH OF RIGHT FOREARM.

Percentile Grade.	5.	10.	20.	30.	40.	50.	60.	70.	80.	90.	95.	Unit.
Before the training.....	16.0	20.0	22.0	24.0	25.0	26.0	27.0	28.0	30.0	31.5	33.0	Kilos.
After 7 months' training.....	20.0	23.0	24.5	25.0	27.0	28.0	29.0	30.0	32.5	34.5	37.0	

There is increase consequently at all the grades. The 50 per cent value before the training (26) is reached between the 30 and 40 percentile grades after the training, and the 50 per cent value after the training is equal to the 70 per cent value before the training.

Strength of Left Forearm. The extreme values were, before the training, 37 and 9 kilos., respectively; after the training, 38 and 16, respectively. Table IX gives the value of the following percentile grades:—

TABLE IX. STRENGTH OF LEFT FOREARM.

Percentile Grade.	5.	10.	20.	30.	40.	50.	60.	70.	80.	90.	95.	Unit.
Before the training.....	14.5	16.0	19.0	20.0	21.0	23.0	24.0	25.0	26.0	28.5	30.5	Kilos.
After 7 months' training.....	18.0	19.0	20.5	23.0	24.0	25.0	26.0	27.0	29.0	31.0	33.0	

Increase is found in all grades. The 80 per cent value after the training (28) equals the 50 per cent value before the training, and the 50 per cent value after the training (25) equals the 70 per cent value before the training.

Total Strength. By this term is understood the sum of the five strength tests mentioned. The extreme values

were, before the training, 311 and 156.5 kilos., respectively ; after the training, 409 and 202.5 kilos., respectively. Table X gives the value of the following percentile grades :—

TABLE X. TOTAL STRENGTH.

Percentile Grade.	5.	10.	20.	30.	40.	50.	60.	70.	80.	90.	95.	Unit.
Before the training.....	176.0	191.0	201.0	213.0	221.0	230.5	243.5	264.0	277.5	293.5	310.0	Kilos.
After 7 months' Training.....	219.0	237.5	254.5	271.0	285.0	293.0	301.5	313.0	325.0	341.0	371.0	

This table shows that the total strength of the 10 per cent grade after the training (237.5) surpasses the 50 per cent grade before the training (230.5), and approaches the 60 per cent grade value (243.5). The 50 per cent value after the training (293) nearly equals the 90 per cent value before the training (293.5), and the 70 per cent value after the training (313) is beyond the 95 per cent value before the training (310).

It is of interest to study the ratio of some of the items mentioned.

Ratio of weight and height, *i. e.*, $\frac{W}{H}$ (W =weight in kilo., H =height in centimetres) expresses how much weight an individual possesses for every centimetre of his stature ; for instance, $\frac{W}{H}=0.340$, *i. e.*, 0.340 kilos. for each centimetre of stature. For the sake of convenience this ratio will be spoken of under the term *weight-height index*. Besides, we present tables indicating the influence of the training upon the following indices :—

Ratio of lung capacity (in litres) and weight ($\frac{L}{W}$), *i. e.*, vital capacity-weight index, or, for brevity's sake, *vital index*.

Ratio of total strength (kilos.) and weight ($\frac{T}{W}$), *i. e.*, *strength-weight index*.

The product obtained by multiplying vital index by strength-weight index ($\frac{L}{W} \times \frac{T}{W}$), *i. e.*, *vital strength-weight index*.

The product obtained by multiplying vital index by total strength $\left(\frac{LC \times TS}{W}\right)$, i. e., *power index*.

The four indices last mentioned were discussed by the writer in a paper read before the American Association for the Advancement of Physical Education, at its eighth annual meeting in Philadelphia, April, 1892, entitled "Some Measurable results of Swedish Pedagogical Gymnastics," and printed in the proceedings of that Association. To this paper those are referred who are interested in a further description of the indices. Here we will only quote some of the results summed up.

1. The *vital strength-weight index* grows parallel with the growth of efficiency and adaptability to gymnastic exercises; and is indicative of the degree of an individual's training with reference to gymnastic exercises. This index becomes still more instructive in this respect if its component vital index and strength-weight index are consulted also.

2. Under ordinary circumstances those women of vital strength-weight index lower than 0.2000 are not in condition for gymnastic exercises so vigorous as climbing; those of 0.3000 or more are in excellent condition for such exercises; those between 0.2000 and 0.3000 are between unable and well-conditioned.

3. Under ordinary circumstances the *vital index* necessary for ability to climb is in the neighborhood of 0.0474, but in combination with a high strength-weight index or a very energetic moral disposition some imperfect climbing may exist with even lower vital index, and has been observed in a case with as low a vital index as 0.0444.

4. Under ordinary circumstances the *strength-weight index* necessary for ability to climb is about 5.4; but, in combination with high vital index or a very energetic disposition, climbing may be possible with lower strength-weight index, and some imperfect climbing has been observed in a case with strength-weight index only 3.6.

5. Two vital strength-weight indices of equal number may have different values, as exponents of physical efficiency, depending upon whether they are composed of a vital index and a strength-weight index of corresponding heights or of a high and a low index.

6. So far as can be judged from observation of about 100 cases, the vital strength-weight indices of women which correspond to the highest efficiency of the most manifold adaptability in the gymnasium are those composed of a strength-weight index of 6.2 or more, and a vital index of 0.0550 to 0.0600 or somewhat above 0.0600. Those composed of a low strength-weight index and a vital index considerably higher than 0.0600 (0.0650 or more) are more difficult to estimate, and their number is comparatively small.

As an illustration of the correlation between the growth of the vital strength-weight index and the growth of working capacity in the gymnasium the following table is offered. It will be understood without further explanation than to say that the marks are our subjective estimate of the capacity of the students to climb the perpendicular rope. The figures indicate the number of students who have the index as given at the top of the perpendicular column, and the mark in climbing as given at the head of the horizontal column. A¹ means excellence; C, entire inability; B², the first struggling success to climb a few inches upward; the other marks indicate the intermediate stages of proficiency.

TABLE XI. COMPARISON OF VITAL STRENGTH-WEIGHT INDICES AND MARKS IN CLIMBING OF 51 JUNIOR STUDENTS OF THE BOSTON NORMAL SCHOOL OF GYMNASTICS.

	0.1669- 0.1999.	0.2000- 0.2499.	0.2500- 0.2999.	0.3000- 0.3999.	0.4000- 0.4999.	0.5000- 0.5999.	0.6000- 0.6999.	0.7000- 0.7999.	0.8000- 0.8999.	0.9000- 0.9999.	1.0000- 1.0999.	1.1000- 1.1999.	1.2000- 1.2999.	1.3000- 1.3999.	1.4000- 1.4999.	1.5000- 1.5999.	1.6000- 1.6999.	1.7000- 1.7999.	1.8000- 1.8999.	1.9000- 1.9999.	2.0000- 2.0999.	2.1000- 2.1999.	2.2000- 2.2999.	2.3000- 2.3999.	2.4000- 2.4999.	2.5000- 2.5999.	2.6000- 2.6999.	2.7000- 2.7999.	2.8000- 2.8999.	2.9000- 2.9999.	3.0000- 3.0999.	3.1000- 3.1999.	3.2000- 3.2999.	3.3000- 3.3999.	3.4000- 3.4999.	3.5000- 3.5999.	3.6000- 3.6999.	3.7000- 3.7999.	3.8000- 3.8999.	3.9000- 3.9999.	4.0000- 4.0999.	4.1000- 4.1999.	4.2000- 4.2999.	4.3000- 4.3999.	4.4000- 4.4999.	4.5000- 4.5999.	4.6000- 4.6999.	4.7000- 4.7999.	4.8000- 4.8999.	4.9000- 4.9999.	5.0000- 5.0999.	5.1000- 5.1999.	5.2000- 5.2999.	5.3000- 5.3999.	5.4000- 5.4999.	5.5000- 5.5999.	5.6000- 5.6999.	5.7000- 5.7999.	5.8000- 5.8999.	5.9000- 5.9999.	6.0000- 6.0999.	6.1000- 6.1999.	6.2000- 6.2999.	6.3000- 6.3999.	6.4000- 6.4999.	6.5000- 6.5999.	6.6000- 6.6999.	6.7000- 6.7999.	6.8000- 6.8999.	6.9000- 6.9999.	7.0000- 7.0999.	7.1000- 7.1999.	7.2000- 7.2999.	7.3000- 7.3999.	7.4000- 7.4999.	7.5000- 7.5999.	7.6000- 7.6999.	7.7000- 7.7999.	7.8000- 7.8999.	7.9000- 7.9999.	8.0000- 8.0999.	8.1000- 8.1999.	8.2000- 8.2999.	8.3000- 8.3999.	8.4000- 8.4999.	8.5000- 8.5999.	8.6000- 8.6999.	8.7000- 8.7999.	8.8000- 8.8999.	8.9000- 8.9999.	9.0000- 9.0999.	9.1000- 9.1999.	9.2000- 9.2999.	9.3000- 9.3999.	9.4000- 9.4999.	9.5000- 9.5999.	9.6000- 9.6999.	9.7000- 9.7999.	9.8000- 9.8999.	9.9000- 9.9999.	10.0000- 10.0999.	10.1000- 10.1999.	10.2000- 10.2999.	10.3000- 10.3999.	10.4000- 10.4999.	10.5000- 10.5999.	10.6000- 10.6999.	10.7000- 10.7999.	10.8000- 10.8999.	10.9000- 10.9999.	11.0000- 11.0999.	11.1000- 11.1999.	11.2000- 11.2999.	11.3000- 11.3999.	11.4000- 11.4999.	11.5000- 11.5999.	11.6000- 11.6999.	11.7000- 11.7999.	11.8000- 11.8999.	11.9000- 11.9999.	12.0000- 12.0999.	12.1000- 12.1999.	12.2000- 12.2999.	12.3000- 12.3999.	12.4000- 12.4999.	12.5000- 12.5999.	12.6000- 12.6999.	12.7000- 12.7999.	12.8000- 12.8999.	12.9000- 12.9999.	13.0000- 13.0999.	13.1000- 13.1999.	13.2000- 13.2999.	13.3000- 13.3999.	13.4000- 13.4999.	13.5000- 13.5999.	13.6000- 13.6999.	13.7000- 13.7999.	13.8000- 13.8999.	13.9000- 13.9999.	14.0000- 14.0999.	14.1000- 14.1999.	14.2000- 14.2999.	14.3000- 14.3999.	14.4000- 14.4999.	14.5000- 14.5999.	14.6000- 14.6999.	14.7000- 14.7999.	14.8000- 14.8999.	14.9000- 14.9999.	15.0000- 15.0999.	15.1000- 15.1999.	15.2000- 15.2999.	15.3000- 15.3999.	15.4000- 15.4999.	15.5000- 15.5999.	15.6000- 15.6999.	15.7000- 15.7999.	15.8000- 15.8999.	15.9000- 15.9999.	16.0000- 16.0999.	16.1000- 16.1999.	16.2000- 16.2999.	16.3000- 16.3999.	16.4000- 16.4999.	16.5000- 16.5999.	16.6000- 16.6999.	16.7000- 16.7999.	16.8000- 16.8999.	16.9000- 16.9999.	17.0000- 17.0999.	17.1000- 17.1999.	17.2000- 17.2999.	17.3000- 17.3999.	17.4000- 17.4999.	17.5000- 17.5999.	17.6000- 17.6999.	17.7000- 17.7999.	17.8000- 17.8999.	17.9000- 17.9999.	18.0000- 18.0999.	18.1000- 18.1999.	18.2000- 18.2999.	18.3000- 18.3999.	18.4000- 18.4999.	18.5000- 18.5999.	18.6000- 18.6999.	18.7000- 18.7999.	18.8000- 18.8999.	18.9000- 18.9999.	19.0000- 19.0999.	19.1000- 19.1999.	19.2000- 19.2999.	19.3000- 19.3999.	19.4000- 19.4999.	19.5000- 19.5999.	19.6000- 19.6999.	19.7000- 19.7999.	19.8000- 19.8999.	19.9000- 19.9999.	20.0000- 20.0999.	20.1000- 20.1999.	20.2000- 20.2999.	20.3000- 20.3999.	20.4000- 20.4999.	20.5000- 20.5999.	20.6000- 20.6999.	20.7000- 20.7999.	20.8000- 20.8999.	20.9000- 20.9999.	21.0000- 21.0999.	21.1000- 21.1999.	21.2000- 21.2999.	21.3000- 21.3999.	21.4000- 21.4999.	21.5000- 21.5999.	21.6000- 21.6999.	21.7000- 21.7999.	21.8000- 21.8999.	21.9000- 21.9999.	22.0000- 22.0999.	22.1000- 22.1999.	22.2000- 22.2999.	22.3000- 22.3999.	22.4000- 22.4999.	22.5000- 22.5999.	22.6000- 22.6999.	22.7000- 22.7999.	22.8000- 22.8999.	22.9000- 22.9999.	23.0000- 23.0999.	23.1000- 23.1999.	23.2000- 23.2999.	23.3000- 23.3999.	23.4000- 23.4999.	23.5000- 23.5999.	23.6000- 23.6999.	23.7000- 23.7999.	23.8000- 23.8999.	23.9000- 23.9999.	24.0000- 24.0999.	24.1000- 24.1999.	24.2000- 24.2999.	24.3000- 24.3999.	24.4000- 24.4999.	24.5000- 24.5999.	24.6000- 24.6999.	24.7000- 24.7999.	24.8000- 24.8999.	24.9000- 24.9999.	25.0000- 25.0999.	25.1000- 25.1999.	25.2000- 25.2999.	25.3000- 25.3999.	25.4000- 25.4999.	25.5000- 25.5999.	25.6000- 25.6999.	25.7000- 25.7999.	25.8000- 25.8999.	25.9000- 25.9999.	26.0000- 26.0999.	26.1000- 26.1999.	26.2000- 26.2999.	26.3000- 26.3999.	26.4000- 26.4999.	26.5000- 26.5999.	26.6000- 26.6999.	26.7000- 26.7999.	26.8000- 26.8999.	26.9000- 26.9999.	27.0000- 27.0999.	27.1000- 27.1999.	27.2000- 27.2999.	27.3000- 27.3999.	27.4000- 27.4999.	27.5000- 27.5999.	27.6000- 27.6999.	27.7000- 27.7999.	27.8000- 27.8999.	27.9000- 27.9999.	28.0000- 28.0999.	28.1000- 28.1999.	28.2000- 28.2999.	28.3000- 28.3999.	28.4000- 28.4999.	28.5000- 28.5999.	28.6000- 28.6999.	28.7000- 28.7999.	28.8000- 28.8999.	28.9000- 28.9999.	29.0000- 29.0999.	29.1000- 29.1999.	29.2000- 29.2999.	29.3000- 29.3999.	29.4000- 29.4999.	29.5000- 29.5999.	29.6000- 29.6999.	29.7000- 29.7999.	29.8000- 29.8999.	29.9000- 29.9999.	30.0000- 30.0999.	30.1000- 30.1999.	30.2000- 30.2999.	30.3000- 30.3999.	30.4000- 30.4999.	30.5000- 30.5999.	30.6000- 30.6999.	30.7000- 30.7999.	30.8000- 30.8999.	30.9000- 30.9999.	31.0000- 31.0999.	31.1000- 31.1999.	31.2000- 31.2999.	31.3000- 31.3999.	31.4000- 31.4999.	31.5000- 31.5999.	31.6000- 31.6999.	31.7000- 31.7999.	31.8000- 31.8999.	31.9000- 31.9999.	32.0000- 32.0999.	32.1000- 32.1999.	32.2000- 32.2999.	32.3000- 32.3999.	32.4000- 32.4999.	32.5000- 32.5999.	32.6000- 32.6999.	32.7000- 32.7999.	32.8000- 32.8999.	32.9000- 32.9999.	33.0000- 33.0999.	33.1000- 33.1999.	33.2000- 33.2999.	33.3000- 33.3999.	33.4000- 33.4999.	33.5000- 33.5999.	33.6000- 33.6999.	33.7000- 33.7999.	33.8000- 33.8999.	33.9000- 33.9999.	34.0000- 34.0999.	34.1000- 34.1999.	34.2000- 34.2999.	34.3000- 34.3999.	34.4000- 34.4999.	34.5000- 34.5999.	34.6000- 34.6999.	34.7000- 34.7999.	34.8000- 34.8999.	34.9000- 34.9999.	35.0000- 35.0999.	35.1000- 35.1999.	35.2000- 35.2999.	35.3000- 35.3999.	35.4000- 35.4999.	35.5000- 35.5999.	35.6000- 35.6999.	35.7000- 35.7999.	35.8000- 35.8999.	35.9000- 35.9999.	36.0000- 36.0999.	36.1000- 36.1999.	36.2000- 36.2999.	36.3000- 36.3999.	36.4000- 36.4999.	36.5000- 36.5999.	36.6000- 36.6999.	36.7000- 36.7999.	36.8000- 36.8999.	36.9000- 36.9999.	37.0000- 37.0999.	37.1000- 37.1999.	37.2000- 37.2999.	37.3000- 37.3999.	37.4000- 37.4999.	37.5000- 37.5999.	37.6000- 37.6999.	37.7000- 37.7999.	37.8000- 37.8999.	37.9000- 37.9999.	38.0000- 38.0999.	38.1000- 38.1999.	38.2000- 38.2999.	38.3000- 38.3999.	38.4000- 38.4999.	38.5000- 38.5999.	38.6000- 38.6999.	38.7000- 38.7999.	38.8000- 38.8999.	38.9000- 38.9999.	39.0000- 39.0999.	39.1000- 39.1999.	39.2000- 39.2999.	39.3000- 39.3999.	39.4000- 39.4999.	39.5000- 39.5999.	39.6000- 39.6999.	39.7000- 39.7999.	39.8000- 39.8999.	39.9000- 39.9999.	40.0000- 40.0999.	40.1000- 40.1999.	40.2000- 40.2999.	40.3000- 40.3999.	40.4000- 40.4999.	40.5000- 40.5999.	40.6000- 40.6999.	40.7000- 40.7999.	40.8000- 40.8999.	40.9000- 40.9999.	41.0000- 41.0999.	41.1000- 41.1999.	41.2000- 41.2999.	41.3000- 41.3999.	41.4000- 41.4999.	41.5000- 41.5999.	41.6000- 41.6999.	41.7000- 41.7999.	41.8000- 41.8999.	41.9000- 41.9999.	42.0000- 42.0999.	42.1000- 42.1999.	42.2000- 42.2999.	42.3000- 42.3999.	42.4000- 42.4999.	42.5000- 42.5999.	42.6000- 42.6999.	42.7000- 42.7999.	42.8000- 42.8999.	42.9000- 42.9999.	43.0000- 43.0999.	43.1000- 43.1999.	43.2000- 43.2999.	43.3000- 43.3999.	43.4000- 43.4999.	43.5000- 43.5999.	43.6000- 43.6999.	43.7000- 43.7999.	43.8000- 43.8999.	43.9000- 43.9999.	44.0000- 44.0999.	44.1000- 44.1999.	44.2000- 44.2999.	44.3000- 44.3999.	44.4000- 44.4999.	44.5000- 44.5999.	44.6000- 44.6999.	44.7000- 44.7999.	44.8000- 44.8999.	44.9000- 44.9999.	45.0000- 45.0999.	45.1000- 45.1999.	45.2000- 45.2999.	45.3000- 45.3999.	45.4000- 45.4999.	45.5000- 45.5999.	45.6000- 45.6999.	45.7000- 45.7999.	45.8000- 45.8999.	45.9000- 45.9999.	46.0000- 46.0999.	46.1000- 46.1999.	46.2000- 46.2999.	46.3000- 46.3999.	46.4000- 46.4999.	46.5000- 46.5999.	46.6000- 46.6999.	46.7000- 46.7999.	46.8000- 46.8999.	46.9000- 46.9999.	47.0000- 47.0999.	47.1000- 47.1999.	47.2000- 47.2999.	47.3000- 47.3999.	47.4000- 47.4999.	47.5000- 47.5999.	47.6000- 47.6999.	47.7000- 47.7999.	47.8000- 47.8999.	47.9000- 47.9999.	48.0000- 48.0999.	48.1000- 48.1999.	48.2000- 48.2999.	48.3000- 48.3999.	48.4000- 48.4999.	48.5000- 48.5999.	48.6000- 48.6999.	48.7000- 48.7999.	48.8000- 48.8999.	48.9000- 48.9999.	49.0000- 49.0999.	49.1000- 49.1999.	49.2000- 49.2999.	49.3000- 49.3999.	49.4000- 49.4999.	49.5000- 49.5999.	49.6000- 49.6999.	49.7000- 49.7999.	49.8000- 49.8999.	49.9000- 49.9999.	50.0000- 50.0999.	50.1000- 50.1999.	50.2000- 50.2999.	50.3000- 50.3999.	50.4000- 50.4999.	50.5000- 50.5999.	50.6000- 50.6999.	50.7000- 50.7999.	50.8000- 50.8999.	50.9000- 50.9999.	51.0000- 51.0999.	51.1000- 51.1999.	51.2000- 51.2999.	51.3000- 51.3999.	51.4000- 51.4999.	51.5000- 51.5999.	51.6000- 51.6999.	51.7000- 51.7999.	51.8000- 51.8999.	51.9000- 51.9999.	52.0000- 52.0999.	52.1000- 52.1999.	52.2000- 52.2999.	52.3000- 52.3999.	52.4000- 52.4999.	52.5000- 52.5999.	52.6000- 52.6999.	52.7000- 52.7999.	52.8000- 52.8999.	52.9000- 52.9999.	53.0000- 53.0999.	53.1000- 53.1999.	53.2000- 53.2999.	53.3000- 53.3999.	53.4000- 53.4999.	53.5000- 53.5999.	53.6000- 53.6999.	53.7000- 53.7999.	53.8000- 53.8999.	53.9000- 53.9999.	54.0000- 54.0999.	54.1000- 54.1999.	54.2000- 54.2999.	54.3000- 54.3999.	54.4000- 54.4999.	54.5000- 54.5999.	54.6000- 54.69
--	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	--------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	-------------------

Imperfect climbing under difficulty corresponds to index	0.2000–0.2500
Growing ability to climb corresponds to index	0.2500–0.3000
Ease in climbing	0.3000–0.3500
Great ease in climbing	0.3500–

While the vital strength-weight index grows parallel with aptitude in such exercises as demand the weight of the body to be lifted by the individual's own muscles (as climbing, jumping, etc.), the power index shows a more marked correspondence with the growing capacity in such exercises in which outer resistance is combated. It deserves to be noted that the power index, being the product of vital index and total strength, i. e., $\left(\frac{LC \times TS}{W}\right)$, is also the product of vital strength-weight index and weight, i. e., $\frac{LC \times TS}{W} \times W = \frac{LC \times TS}{W}$.

Weight-Height Index. The extreme values are, before the training, 0.454 and 0.270, respectively; after the training, 0.454 and 0.259, respectively. Table XII gives the value of the following percentile grades:—

TABLE XII. WEIGHT-HEIGHT INDEX.

Percentile Grade.	5.	10.	20.	30.	40.	50.	60.	70.	80.	90.	95.
Before the training.....	0.279	0.290	0.299	0.312	0.322	0.331	0.343	0.351	0.372	0.389	0.401
After 7 months' training.....	0.274	0.286	0.301	0.312	0.320	0.330	0.344	0.351	0.366	0.384	0.405

The general tendency has been towards a slight diminution of this index under the influence of the training.

Vital Index. The extreme values are, before the training, 0.0710 and 0.0307, respectively; after the training, 0.0720 and 0.0409, respectively. Table XIII gives the values of the following percentile grades:—

TABLE XIII. VITAL INDEX.

Percentile Grade.	5.	10.	20.	30.	40.	50.	60.	70.	80.	90.	95.
Before the training.....	0.0384	0.0407	0.0430	0.0456	0.0480	0.0499	0.0513	0.0536	0.0570	0.0602	0.0661
After 7 months' training.....	0.0438	0.0450	0.0475	0.0495	0.0506	0.0530	0.0550	0.0585	0.0590	0.0630	0.0661

Increase of this index has been the general result of the training, except in the highest percentile grades, and the increase has been greatest at the lower grades. The value at the 80 per cent grade after the training (0.0495) approaches the 50 per cent value before the training (0.0499), and the 50 per cent value after the training (0.0530) approaches the 70 per cent value before the training (0.0536).

Strength-Weight Index. The extreme values observed are, before the training, 6.4 and 2.87, respectively; after the training, 7.33 and 3.6, respectively. Table XIV gives the values of the following percentile grades:—

TABLE XIV. STRENGTH-WEIGHT INDEX.

Percentile Grade.	5.	10.	20.	30.	40.	50.	60.	70.	80.	90.	95.
Before the training.....	3.26	3.47	3.72	3.96	4.12	4.40	4.53	4.8	5.27	5.70	5.98
After 7 months' training.....	4.02	4.36	4.77	4.94	5.28	5.48	5.86	6.0	6.36	6.65	7.60

Increase of this index has taken place at all the grades. The value of the 10 per cent grade after the training (4.36) reaches nearly the 50 per cent value before the training (4.40), while the 50 per cent value after the training (5.48) is about equal to the 85 per cent grade before the training.

Vital Strength-Weight Index. The extreme values are, before the training, 0.415 and 0.108, respectively; after the training, 0.527 and 0.166, respectively. Table XV shows the values of the following percentile grades:—

TABLE XV. VITAL STRENGTH-WEIGHT INDEX.

Percentile Grade.	5.	10.	20.	30.	40.	50.	60.	70.	80.	90.	95.
Before the training.....	0.1290	0.1480	0.1710	0.1925	0.2060	0.2180	0.2385	0.2530	0.2730	0.3170	0.3320
After 7 months' training.....	0.1925	0.2150	0.2445	0.2575	0.2690	0.2845	0.3060	0.3325	0.3600	0.3810	0.4100

We find that the value of the 10 per cent grade after the training (0.2150) approaches the 50 per cent value before the training (0.2180), and that the 50 per cent value after

the training (0.2845) is higher than the 80 per cent value before the training (0.2780).

Comparing with the subjective estimate of ability to climb, referred to above, we find that the vital strength-weight index necessary for climbing is —

With difficulty (about 0.2000) before training at 40 per cent, after training at 10 per cent.

Ability (about 0.2500) before training at 70 per cent, after training at 30 per cent.

Ease (about 0.3000) before training at 90 per cent, after training at 60 per cent.

Great ease (about 0.3500) before training at 00 per cent, after training at 75 per cent.

Power Index. The extreme values of this index are, before training, 18.6 and 4.9, respectively; after training, 25 and 9.3, respectively. Table XVI gives the values of the following percentile grades:—

TABLE XVI. POWER INDEX.

Percentile Grade.	5.	10.	20.	30.	40.	50.	60.	70.	80.	90.	95.
Before the training.....	8.10	8.65	9.9	10.35	11.10	11.9	12.45	13.15	13.95	15.10	15.50
After 7 months' training.....	11.05	11.65	13.3	14.10	14.85	15.7	16.40	17.15	17.70	18.95	19.95

The value of the 10 per cent grade (11.65) after the training approaches the 50 per cent value before the training (11.9), while the 50 per cent value after the training (15.7) surpasses the value of the 95 per cent grade before the training (15.5).

The anthropometrical data which we have presented above justify the opinion that the susceptibility of American women to gymnastic training is considerable. The tables of strength and lung capacity, and, still better, the computed indices, the vital strength-weight index, and the power index, show that by seven months' training the mere physical working capacity of these women, such as manifests itself in gymnasium work, has grown from the 10 per cent grade to the 50 per cent grade, and from the 50 per cent grade to the 80 or 90 per cent grade.

Synopsis.]

RAILWAY FREIGHT TRAFFIC STATISTICS.

BY C. P. LELAND,

AUDITOR OF THE LAKE SHORE & MICHIGAN SOUTHERN RAILWAY CO., AND PRESIDENT, 1892-93, OF THE ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.

Within the last few years statistics have come to be valued as a vital necessity to the successful operation of our railways.

Perhaps the Lake Shore & Michigan Southern Railway, with its eastern terminus at Buffalo, at the foot of the Great Lakes, and its western terminus at Chicago, the head of the Great Lakes, traversing six great states, with branches largely exceeding in mileage its main line, has as great a variety of traffic as any railway in this country. While it has but 1454 miles of road (less than one per cent of the mileage of the United States) it handled, in 1892, 13,643,747 tons of freight and 5,846,755 passengers. As I myself have kept its statistics for thirty-three of its forty-one years, and have made up and issued thirty-three consecutive annual reports (1860-92), I shall confine the inquiry to the statistics of that railroad.

RATES.

The average rate per ton per mile can be had for thirty-nine years, since 1853. During this period, in 1868, the Bessemer steel rail was introduced. Notice the tendency of rates from 1868, as shown in the following table:—

AVERAGE RATE PER TON PER MILE OF THE LAKE SHORE & MICHIGAN SOUTHERN RAILWAY.

Years.	Cents.	Years.	Cents.	Years.	Cents.
1854	3.510	1867	2.427	1880	.750
1855	3.210	1868	2.336	1881	.617
1856	2.960	1869	1.714	1882	.628
1857	2.740	1870	1.504	1883	.728
1858	2.380	1871	1.391	1884	.662
1859	2.292	1872	1.374	1885	.553
1860	2.157	1873	1.335	1886	.639
1861	2.092	1874	1.180	1887	.670
1862	2.099	1875	1.010	1888	.636
1863	2.296	1876	.817	1889	.664
1864	2.833	1877	.864	1890	.626
1865	2.903	1878	.734	1891	.628
1866	2.476	1879	.642	1892	.599

This table shows that the rate per ton per mile for 1892, a trifle under six mills, was but —

80 per cent of the rate for 1880				
40	"	"	"	1870
28	"	"	"	1860
17	"	"	"	1854

When a railroad moves 100 tons of average freight one mile for a little less than 60 cents it would seem as if the bottom had been reached. The great majority of the railroads in the United States could not meet their fixed charges with an average rate of six, or even eight, mills per ton per mile.

With a considerably higher average rate in 1892 (a little less than one cent per ton per mile, .967), all the railroads of the United States, out of gross earnings aggregating \$1,205,272,023, paid but \$83,336,811 in dividends on \$4,920,555,225 capital stock, less than 1.7 per cent, and 1892 was a very prosperous year. A further reduction in the average rate per ton per mile of only one mill, 10 per cent, would cut down the freight earnings of all the railroads in the United States \$84,448,197, thus obliterating the aggregate dividends of 1892 (\$83,336,811).

This close margin thus shows the vital necessity of scrutinizing freight statistics.

COMMODITY STATISTICS.

To an intelligent management of a railway, seeking how and where to increase its traffic, commodity statistics are of inestimable value.

The Lake Shore freight traffic is divided into 14 commodities, or general heads. I here give the figures for 1870 and for 1892, showing the growth of each commodity in 23 years.

	Tons, 1870.	Tons, 1892.	Per Cent Increase.
Coal and Coke.....	215,997	3,692,551	1,610
Iron Ore (commenced in 1876).....	.....	1,337,901	.....
Stone, Sand, and Lime.....	95,521	1,137,583	1,091
Pig, Bloom, and R. R. Iron.....	76,012	283,503	273
Other Iron and Castings.....	66,778	635,312	851
Petroleum.....	260,959	427,419	64
Total Minerals.....	715,267	7,514,269	951
Grain.....	451,431	1,234,677	173
Other Agricultural Products.....	149,031	375,842	152
Flour and Flour Mill Products.....	327,812	470,966	44
Provisions.....	132,645	278,313	110
Animals.....	276,531	561,597	103
Total Food.....	1,337,450	2,921,395	118
Lumber and other Forest Products.....	334,581	924,901	176
Manufactures.....	199,547	434,374	118
Merchandise and other Articles.....	391,880	1,848,808	372
Grand Total.....	2,978,725	13,643,747	358

This table shows at a glance how poor is the railroad that has to depend almost entirely upon farm products for its traffic.

STATION STATISTICS.

Without these the general statistics of a railroad would be of no account. The President or Manager wants to know the springs or sources, which combined make the mighty torrent of a certain kind of freight, and the same of passengers.

While the Lake Shore & Michigan Southern has 319 passenger stations, 90 per cent of its passenger earnings comes from 57 stations. While it has 270 freight stations, 96 per cent of its freight earnings comes from 76 stations.

The traffic and accounts of all these stations has been kept for 33 years. Each one has its peculiarities. A car load of

Lake Superior iron ore from Ashtabula Harbor would be as great a curiosity in Chicago as would a car of dressed beef from Chicago be at Ashtabula Harbor; and so each station must have its own facilities in buildings, tracks, etc., and the extent of these must be gauged largely upon statistics, not only of its tonnage, but the kind of freight that makes up that tonnage. As with freight so with passengers. Growing, improving stations must be served with more trains, and decaying, declining stations with less.

Neither the student of industrial questions nor the official statistician can have a higher appreciation of the importance of accurate and comprehensive statistics than the manager of a large railway corporation.

The complete text of the above paper will be found in the *Railway Review*, Sept. 30, 1893.

48-86

7.

7

